July, 1948

EDISON ELECTRIC INSTITUTE BULLETIN

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		Page
Revolutions and Roadblocks	CHESTER H. LANG	229
The Role of Government in Labor Relations	CYRUS S. CHING	233
Thirty Thousand Hours A Minute	GWILYM A. PRICE	236
Taxes and the Stockholder	LEE P. STACK	239
Rural Electrification From the Power Company Viewpoint	GROVER C. NEFF	244
The Engineer and Internationalism	E. G. BAILEY	249
The Prime Movers Committee		254
Joint A.E.I.C.-E.E.I. Heat Pump Committee Survey		256
Personals		258
Conventions and Meetings		260

PUBLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

April, 1947-1948

SOURCE AND DISPOSAL OF ENERGY - MONTH OF APRIL

GENERATION* (Net)	1948	1947	%
By Fuel Burning Plants	14,415,663,000	13,216,239,000	+ 9.1
By Water Power Plants	7,880,690,000	7,287,486,000	+ 8.1
TOTAL GENERATION	22,296,353,000	20,503,725,000	+ 8.7
Add -- Net Imports Over International Boundaries	111,010,000	121,307,000	- 8.5
Less - Company Use	125,444,000	138,301,000	- 9.3
Less - Energy Used by Producer	416,935,000	414,472,000	+ 0.6
NET ENERGY FOR DISTRIBUTION	21,864,984,000	20,072,259,000	+ 8.9
Losses and Unaccounted for	2,464,984,000	2,407,297,000	+ 2.4
SALES TO ULTIMATE CUSTOMERS	19,400,000,000	17,664,962,000	+ 9.8

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS - As of April 30th			
Residential or Domestic	32,170,637	30,253,289	+ 6.3
Rural (Distinct Rural Rates)	1,578,780	1,440,260	+ 9.6
Commercial or Industrial			
Small Light & Power	5,013,767	4,791,166	+ 4.6
Large Light & Power	194,071	181,010	+ 7.2
Other Customers	137,227	128,663	+ 6.7
TOTAL ULTIMATE CUSTOMERS	39,094,482	36,794,388	+ 6.3
KILOWATTHOUR SALES - During Month of April			
Residential or Domestic	4,158,985,000	3,571,875,000	+16.4
Rural (Distinct Rural Rates)	463,227,000	421,408,000	+ 9.9
Commercial or Industrial			
Small Light & Power	3,450,087,000	3,070,169,000	+12.4
Large Light & Power	10,014,443,000	9,264,496,000	+ 8.1
Street and Highway Lighting	187,530,000	178,375,000	+ 5.1
Other Public Authorities	509,026,000	494,452,000	+ 2.9
Railways and Railroads			
Street & Interurban Railways	339,207,000	396,350,000	-14.4
Electrified Steam Railroads	220,712,000	221,571,000	- 0.4
Interdepartmental	56,783,000	46,266,000	+22.7
TOTAL TO ULTIMATE CUSTOMERS	19,400,000,000	17,664,962,000	+ 9.8
REVENUES FROM ULTIMATE CUSTOMERS	$ 346,644,500	$ 310,762,400	+11.5

RESIDENTIAL OR DOMESTIC SERVICE

Average Customer Data - For 12 months ended April 30th			
Kilowatthours per Customer	1,490	1,368	+ 8.9
Average Annual Bill	$45.30	$43.23	+ 4.8
Revenues per Kilowatthour	3.04¢	3.16¢	- 3.8

* By courtesy of the Federal Power Commission

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 16 JULY, 1948 No. 7

Revolutions and Roadblocks

By Chester H. Lang

Vice President and General Manager of Sales, Apparatus Department, General Electric Company

An Address before the Sixteenth Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 1, 1948

IT will be my purpose to recount some of the milestones along the road of the achievements of this industry, and to reconnoitre a roadblock or two which is reported to be obstructing the highway we've been travelling together with gathering momentum since 1882.

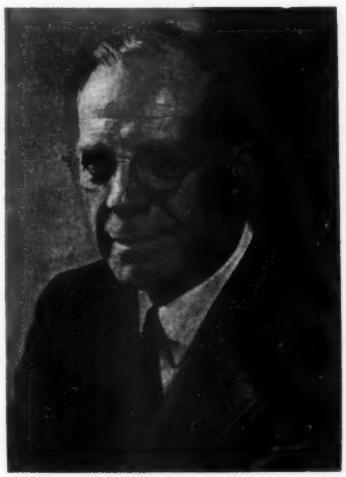
First let me make a clear declaration of my belief and faith in the thing that brings us together today. Electric power under your stewardship, in these brief 66 years, has done more to revolutionize the well-being of the people of the world, than any other material thing in recorded history.

I bring this up because I'd like to touch upon revolutions and revolutionists, and in passing pay my respects to the Communists as a bunch of second-rate revolutionists.

Communist Methods

Look at their methods. Are these the ways of achieving a permanent, significant revolution: Deceit. Despotism. Violence. Secret Police. Boring from within. Underground organization. Why, these are the methods of people who are *afraid* of change! The Communists—who are good at slogans—call this "The People's Revolution." Their purpose, they claim, is to revolutionize the world's economic way of life, to bring the people a classless society with a high standard of living for all.

Well, as Al Smith used to say, "Let's look at the record!" What nation has come closest to achieving this revolution—within the single span of a human lifetime? What nation can best show the world—by example, and not by domination—how to achieve the long-sought revolution?



MR. LANG

If the world has any hope of achieving the classless society, with good living for all, they should stop studying second-rate revolutionists, and look at America. We got our political revolution behind us in 1783, and in the past seventy years we have been carrying on the greatest social-economic revolution that has ever been played on the stage of history.

Now, this is mighty proud talk. And I'm intentionally using dramatic terms to speak of things that we don't, in our middle class innocence, ordinarily call revolutionary. Particularly in the electrical industry, we see expansion and change and progress as the normal characteristics of human experience. In a large sense, we powered this recent economic revolution—but we haven't hung out a revolutionary banner to announce it.

But actually, this nation has come very close to achieving the goals of the "People's Revolution." In a speech given by C. E. Wilson to a group of 25-year men in the General Electric, he said:

"There are fewer economic distinctions—between rich people and poor people—in the United States than in any country in the world. Where once only the rich could afford candles at night, today the finest lamps that money can buy and science can produce cost only a few cents and are available to all. Rich men—the few that remain—can buy no better refrigeration and washing machines and telephones and plumbing and transportation than are available to everybody. Who has been more successful than the average American in his quest for economic betterment, social progress, and political freedom? Who produces more of the world's goods and enjoys more of the benefits than we do? Who is more his own master? Yes, the United States is the standout economic and political success of all time. That sounds like extravagant language, but we know it is a solid, unvarnished fact in the modern world."

"No Other Nation . . ."

Paraphrasing the cigarette ad, "No other nation can make this statement!"

Many things have happened in the lifetime of thousands of average Americans. When we think of it at all, we're likely to think of this change as a case of *evolution*—gradual change. And buried in the day-to-day

operation of our fascinating electrical industry, we seldom poke our heads up to notice the potent role of electric power in the achievement. And yet, compare this *evolution* with any *revolutionary* era in history. We, in our free enterprise system, are engaged in the biggest revolutionary movement in history. It's time we recognize it as such and make the most of it.

Has the course of this progress run out? Is our revolution an accomplished fact? In our own area of duty, the great electrical industry, have we reached an insurmountable roadblock? Of course not. Only in our weaker moments do we permit such thoughts. This very meeting is not to discuss achievements, but to discover how to overcome obstacles and solve problems. These are the sure identifying characteristics of the pioneer.

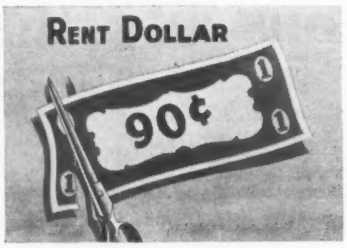
America, and particularly the electrical industry, is not slowing down for a rest. On the contrary, our revolution is just gathering momentum. At this very moment, with kilowatt-hour output at a peak, demand for new and additional service exceeds our most optimistic curves and dreams. Future growth bids fair to make the past 70 years look like a warm-up session. Better than any other industry, you know the necessity to be prepared for maximum output whenever it is required.

Industry Achievements

That is largely why, during the war, the electric power industry was able to deliver power, not alibis. That is why in the boom year of 1947, in spite of an incredible 47 million kw peak demand, and in the face of calamity howlers in the public press, the electrical industry was able to deliver the goods.

So much for an inadequate picture of the power industry's achievements. There are milestones galore which mark the revolutionary road so successfully traveled. There have been innumerable obstacles—roadblocks formidable and insignificant—encountered and surmounted. Others lie immediately ahead; still others will appear. A word then about a few of these roadblocks which may at the moment loom large.

In my job, of course, I naturally see a goodly number of utility friends in a year. And so I've found myself conducting a kind of informal survey, to find out just what, actually, are the main planks in your platform for the future to cope with the difficulties ahead. Perhaps some of you will recognize your own thoughts coming back at you as I attempt a grass-roots appraisal of your program for tomorrow, as expressed by your own people. What they say seems to take shape as a kind of six-point program.



First of all, one is assured of a fundamental belief in the necessity for an aggressive, continued program of plant expansion. The six-billion-dollar expansion program, as reported in the E.E.I. BULLETIN, is a giant stride in that direction.

Six billion dollars invested by one industry in five years for the benefit of John Public! This could only happen in America. Not even the largest of the totalitarian states could implement such a program in so short a time; and if they could, I doubt that their governments would be willing to make such an investment for the peaceful benefit of the little people.

Yet, great as your expansion program now is, there is a growing recognition that even this is not enough; that, as the American economy expands, the power industry in its traditional role of leadership must *double* and *triple* its capacity to generate electric power.

"Bearish" Opinions

Quite frankly, not all the opinions were quite so bullish. Some of my associates have already expressed concern about a certain undertone, hinting that if there is a slump in business, there may be cancellations. I needn't express my reaction to this short-sighted view except to report that it apparently is not even well-enough formulated to be a minority opinion. The leaders of this industry are vividly aware that the present troublesome shortage of reserves is fundamentally traceable to the depression, 15 years ago, when plant expansion was drastically curtailed. We have been struggling through the war and the postwar strikes and material shortages, trying to make up for that grievous loss. And the vast majority of this industry's leaders are determined that it will not happen again. The very heart of their program for the future is a continued, systematic expansion of generating capacity.

Second plank in your program, according to these interesting conversations, is an increasing awareness of

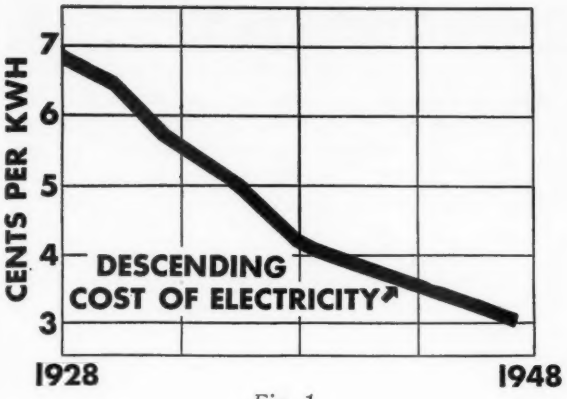


Fig. 1

This Curve Accurately Depicts the Economic Marvel of Our Time—

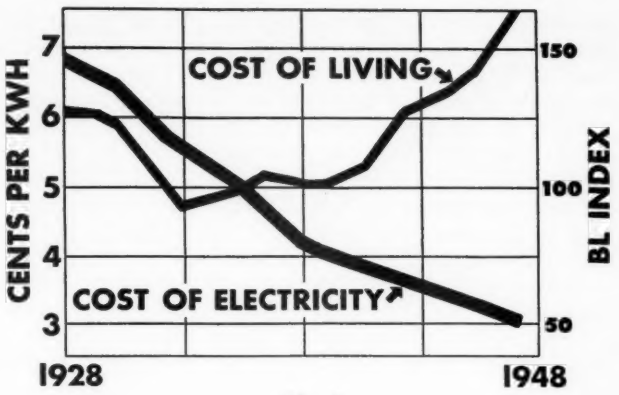


Fig. 2

—Particularly when Contrasted with the Rising Cost of Living

the importance of public relations. It is clear that the public will no longer be uninformed about the achievements of the business-managed power companies. In Boca Raton, last April, we heard J. W. McAfee emphatically state that sound public relations are a prime responsibility of management. Any reader of the popular magazines is familiar with that effective series of advertisements, jointly sponsored by the business-managed companies, which is driving home the achievements of the free electrical industry.

Keep at it, keep everlastingly at it. Secrecy in business has become outmoded. Tolay it is recognized that a vigorous, forthright, and well-supported program of public relations is an indispensible part of successful business operation and the best assault against the roadblock of unnecessary government regulation.

The third major plank in your platform for the future is a renewed willingness to fight, boldly and unafraid for sound financial results. The utility industry has a committed expansion program in excess of 1½ billion dollars per year, but cash generation within the companies will provide only 500 million a year. Thus utility needs for *new private capital* are nearly a billion a year, representing one-seventh of the new capital needs of *all* industry. Earnings must be attractive enough to bring in this capital. And this involves the fundamental question of rates.

On Rate Rises

One would be rash indeed to talk rates to experts. But if a rise in rates is called for to provide sound results for a particular company, why be timid about it? Fig. 1 accurately depicts the economic marvel of our time —the descending cost of a kilowatt-hour of residential electricity—particularly when it is contrasted with the rising cost of living in these inflationary times (See Fig. 2).

Here are some figures from the U. S. Bureau of Labor Statistics which punch home that significant "fact of life." Let's say a big dollar bill represents the old-fashioned 100-cent dollar that existed in 1939. Today, when applied to rent, that dollar is worth only a piece of its former self—90 cents to be exact. When applied to house furnishings you may as well throw away almost half of it, because it's only worth 52 cents worth of house furnishings today. The 1939 clothing dollar is worth only 51 cents now. And as for buying food—the 1939 dollar bill will buy only 47 cents worth of food. Yes, the dollar has

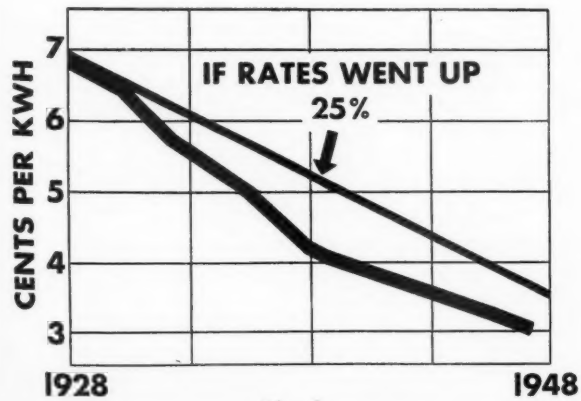


Fig. 3

If the Lower End of the Rate Curve Were Raised 25 Per Cent—

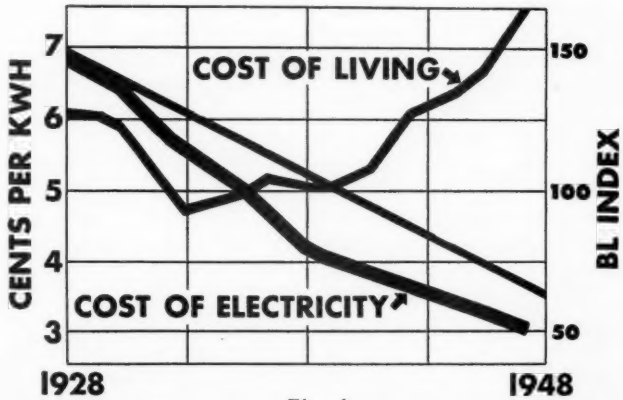


Fig. 4

—Still a Handsome Piece of Economic Art Compared to the Cost of Living

shrunk considerably these days. In fact, the only bargain left, the only place where the consumer's dollar bill is actually bigger now than it was in 1939, is at the pay window of his electric company. There, his 1939 dollar bill will now buy him $1.29 worth of electricity. The electricity dollar is truly the economic wonder of the age. It has grown bigger and bigger, buys more and more electricity.

Fig. 3 shows that if rates were 25 per cent higher at the end of 1947, we would still have not changed very much from Fig. 1 above, and compared to that awful Cost of Living Curve (See Fig. 4), it would still be the economic marvel of our age.

I hasten to say again, rate changes are not in my bailiwick. But if inadequate rates stand in the way of steady, planned expansion of generating capacity, I repeat—I see no reason to be timid about fighting for a change in rates.

Rising Cost of Money

A fourth problem frequently mentioned is another element in the financial picture. And that is the rising cost of money. There's no denying this rise. Long-term lenders are asking a higher interest rate.

Our treasurer assures me not only that interest rates are up, but that they will go higher and there is nothing to do but plan accordingly. Money will be a good buy, as compared with prewar, even at considerably higher rates.

There is a fifth point that figured strongly in many conversations—and that is the attraction of top-quality men into the ranks of your organizations. Its importance was dramatically presented at last year's meeting. Throughout the electrical industry, there is an increasing emphasis on *recruiting* campaigns which are not only better organized, but more inspired. Specifically, the industry is attempting to attract men with courage and the competitive spirit—rather than the security-minded. One important way to attract the aggressive and the courageous is to make it evident that this is a courageous industry.

By example, and by specific public statement, it must be made clear that this is an industry of pioneers who have made a successful business operation out of rendering a vital public service. We must make it clear that this is a good business to get into—an expanding one, with great rewards for vision and daring. We must make it clear that there are financial rewards for aggressive men; and there is in addition the great satisfaction that comes in performing a valuable public service.

What an opportunity awaits the man in the electrical industry today! What an opportunity for a man who really wants to move ahead! Because, quite literally, it is impossible to stand still in this business. The American economy is not a static, monolithic monument to the past; it is a dynamic, living organism. And the throbbing heart of it is this electrical industry, pulsing power to every part of the nation. As the nation grows, there must be a corresponding growth in the sources of electric power. Financing problems—rate problems—government problems—these are nothing compared to the sickening stagnation and decay that will follow as surely as death follows life, if we fail to attract men who have the courage to *keep building.*

There is a proverb, Chinese, I am told:

"If you are planning for one year, sow grain.
If you are planning for ten years, plant trees.
But when you are planning for a hundred years, grow men!"

There is one more (a sixth) plank in this platform for the future—one that was expressed over and over by the men who guide the industry's destinies. One after another said, "In spite of our short reserves, our company is going to *accelerate* its selling program."

Business Is Selling

Well, as a salesman, I take such things for granted. Good heavens—what is business, but selling your product? Selling, selling, constantly searching for new markets, new opportunities to expand the business. Only by continually selling the advantages of electrification in the home, the store, the city, the farm, the factory, will your long-term sales objectives be achieved. They stretch far beyond these passing days of tight reserves.

It's not unusual, in American business, to go on selling when you're already getting rid of your complete current output.

You may remember that the "More Power to America" program was launched while we were still at war, in a long-term cooperative effort to put more electric power into the hands of the American workman. Our mutual goal was a national average of 6 kwhr per manhour, by 1950. In spite of obstacles only too familiar to you, we're keeping ahead of schedule. The current national average now stands at 5.3 kwhr per manhour, and appears to be climbing steadily as industry realizes that increased individual productivity is the only way out of our economic dilemma.

Details of this active program will be discussed with your associates at the Adirondack Power Conference June 7. Wholehearted support of the "More Power to America" program is only one of the ways in which you can implement the renewed efforts of your sales force.

Sales Organization Support

To this policy-making group I want to make an urgent plea for vigorous decisive support of your sales organization. Facing the facts of life, you know that an accelerated selling program is going to accelerate only if you want it to; if you set the course, and back it with the funds to make it go.

Here, more than in any other element of your business, you can prove that faith in the industry which I hear expressed on all sides, and particularly by the industry's best young men. For the power salesman today is more than a business agent, though that is honorable enough. He is the agent—*your* agent—in an economic revolution that has America as its fountainhead, and is flowing to all parts of the world.

This nation has it in her power—in her destiny—to usher in a new era of abundance and peace. To an astonishing degree, the achievement of that high hope depends on the actions of the leaders of the power industry.

You are the agents of an industrial revolution. But unlike the traditional pie-in-the-sky revolutionist, your role is a constructive one. Simply, it consists of being good, sound, aggressive businessmen operating in the invigorating climate of a free economy. Your program of action, if I have interpreted correctly what many of you have said, reflects just that, which restated briefly are these six planks I've had the temerity to read into your platform.

(*Continued on page* 235)

The Role of Government in Labor Relations

By Cyrus S. Ching
Director, Federal Mediation and Conciliation Service

An Address before the Sixteenth Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 2, 1948

IT IS rather a paradoxical situation for a Democratic President to select a life-long Republican who has spent all his life in industry for an impartial job in government, but that is where I find myself, trying to do that job.

Several people have asked me and asked my wife, why I ever took this job, and she told the last man that asked her, "If you ever find out, let me know."

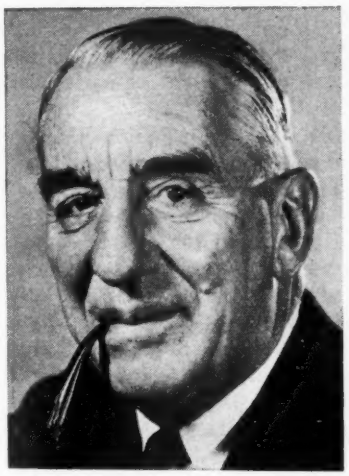
But I have been for many years thinking in these terms, that all of us, everyone connected with business, owes it to himself, to the business interests of the country, and to the country itself to know some more about government, and to make some contribution to the country's welfare.

Also I felt that I owed a great deal to this country and made up my mind that I was going to devote a part of my life, at least, to the service of the country in the best way that I could, and when this post was offered to me, I took it.

Businessmen and Government

This is far from labor relations, but I can't miss the opportunity to make this point. I don't see that any men going to Washington have any right to criticize anyone they meet down there for lack of understanding of their business, for not giving the proper consideration to them, or for not knowing their problems. The generally unsatisfactory situation that results when business people go to Washington about their business can be attributed to their unwillingness to go down there when needed to help the government understand their businesses.

I spent several of the war years in Washington. It happened that one time I was looking for about 10 or 11 men to serve the country in time of war in civilian capacities, and I made



MR. CHING

1,026 telephone calls before I succeeded in getting eight responses. I never had such cooperation in my life. I called Cleveland, and the man in Cleveland knew a man in Chicago who would be excellent. Then I called the man in Chicago and he knew someone in Grand Rapids, Michigan. Talk about a run-around in Government! In some of the trade associations and business organizations, businessmen give you the run-around when you are trying to get someone to go to work for the Government. That happened to be my job there, to try to get some people, and it was extremely discouraging. So, if you're in Washington, don't complain to me about anyone you have to do business with who seems to know nothing about business, nothing about banking, or nothing about anything. There will be plenty of opportunities for you to serve your country in some capacity and understand government a little better than you do; and you will be able to make the government understand you a little better than they do.

So I think that none of us has a right to sneer at our Government, a popular pastime with the American people. I don't know that we can afford to have the Legislative Branch of the government talking about the Executive Branch and the Executive Branch talking about the Legislative and the Administrative Branches, and the whole general public talking about the bunch of bureaucrats down in Washington. As a matter of fact, there are a lot of people who are really trying to do a good job in government.

With the leadership that we have taken in world affairs, we can no longer indulge in this luxury. I don't know that other people will understand us when we start abusing each other and calling each other crooks and what have you, as we have done in the past. We understand it here. We say that is funny, it is quite amusing, quite a joke, and we forget it the next day.

Criticism of Government

But I rather assume that some of the things we have done and said in the past in political campaigns might make very interesting reading in Moscow or in some other country that was not interested in our welfare. And I don't know whether we can afford it much longer, because, after all, this freedom that we enjoy is not something that is permanent. It is not just inherited wealth. It is something that each generation must buy. Every generation must pay its installment on the price of freedom. And one way we do it is by supporting our government and the type of government we have—criticizing government when it is wrong, but not criticizing government when we do not know the facts.

I think that one of the greatest privileges we have and one of the greatest opportunities we have to serve our country is to criticize government when we know what we are

talking about, but I don't like criticism that comes just because a thing is government, and therefore must be wrong.

At this point, I will give you a little idea of my conception of the role of government in labor relations.

In 1913, the United States Conciliation Service was set up in the Department of Labor, and the service functioned through and expanded during the First World War. It expanded during the period from 1933 to 1939, and during the Second World War it expanded still further. It was set up last year as an independent agency reporting to the President of the United States and to the Congress, and it has no connection whatsoever with the Department of Labor.

Congressional Limitations

In addition to making it an independent agency, the Congress imposed certain statutory limitations and restrictions and responsibilities on the service that did not heretofore exist. So we are now operating as an independent agency, and our statutory limitations require us to keep out of the things that do not ordinarily affect interstate commerce in a substantial way.

I wish that somebody could draw a blueprint as to what that means. We don't know. We are struggling with it and are at a loss to try to find out what type of a case we go in or stay out of. For instance, the case of a company that might be represented here. It might be a small company, it might not sell one kilowatt of power over state lines; it might be serving only a very small local community. That could be considered as intrastate commerce, and the Federal Government should have nothing to do about it. But along comes someone and says that the electric power that the company furnishes is used to manufacture goods in interstate commerce, and a substantial interference with commerce could result because of a shut-down in that particular utility.

So there we are. And we try to use our best judgment and discretion as to the type of case we go in and the type of case we stay out of.

There are about 250,000 collective bargaining agreements in this country, and we have on file several hundred thousand now. We have only 226 men covering the whole United States, making it almost impossible to get into all of them. So we only get into the cases that are more important.

However, we do have an entirely different conception of the service than existed at the time when the service was set up. If we in this service can so operate that we will eliminate the major portion of the labor disputes that come up, then I think we will be rendering a real service. I think that I would rather go to the Congress and ask for 200 extra men to do a little fire prevention work than to feel that a situation existed where it was necessary to put more men on to settle labor disputes.

One of the contributions the service can make and one of the contributions we are now trying to make is in the prevention of labor disputes. We are trying to establish confidence in the service on the part of both management and labor, so that we can be looked on and called on to help in times of peace to obviate some of these disputes that come up.

I don't expect we will ever be without labor disputes. I hope not. I hope we will always have some, because if we don't something will have gone wrong with the American people. The only place that you don't have labor disputes, or conflicts of this kind, is in a country like Russia, or pre-war Germany. The freedom to spit at each other and punch each other on the nose once in a while is rather healthy. Nevertheless, many of our labor disputes should and can be avoided if intelligence and reasonableness are used on both sides.

Labor Relations Are Human Relations

There isn't any particular mystery in dealing with human beings in this labor relations field. It is ordinary common human relations, and people are much the same no matter where you find them. People act as human beings, and all of the reasonableness or unreasonableness is not on one side.

We have a case today of the president of a large corporation, and we also have a similar one involving the president of a mine workers' union. They haven't the slightest connection with each other. The president of the corporation says, "I won't deal with this group that you have in this union. I'll deal with Bill and Jack and Joe, but I won't deal with these representatives at all." Then there is a strike.

We have the president of the mine workers' union saying, "I'll deal with these fellows and this fellow, but I won't deal with Joe Moody."

I don't see any difference between the two men. In this country, we have established, like it or not, collective bargaining as a means of settling labor disputes. A lot of people don't like it. They don't like to deal with unions. They wonder why unions are in the picture at all. But there it is; that is the law of the land, and it has been spelled out twice in two statutes —once in the Wagner Act and again in the Labor Management Relations Act of 1947. The function of our service is to try to make it work.

Collective Bargaining

Collective bargaining, as such—and there is no particular magic to it—can be made one of the constructive forces in our whole national economy, in our whole political setup, in our government itself, if labor and management will make up their minds that they are going to accept the responsibility that goes with it when they go in to meet with each other and carry on negotiations, if they appreciate what their responsibilities are to the country and to the people that they represent as well.

If people start in to use collective bargaining as a means of building up further conflicts, then it won't work and we will be in trouble. If we reach a point in this country where our people are divided into classes, one group fighting another group, we will indeed be in a bad way.

It is difficult at times to understand why people refuse to learn about each other and about getting along with other human beings. We don't seem to have made much progress. I can take a labor contract, and I can read it over and tell you what happened. I have seen enough of them to be able to do that, and here is what usually happens. I don't suppose it ever happened in the public utility industry but it happens in others because some, perhaps, are not so enlightened.

A company has six or seven hundred employees. You talk to the president of the company, or one of the other officers, and he says, "We have no trouble at all here. We are just one great, big happy family." Probably someone will ask him, "What way do you have of contacting your employ-

ees? How do the employees contact you, or do you contact them? Do you think such contact is necessary?" The executive answers, "The door of my office is always open. Any employee of the company can come in any time he wants to and talk anything over that he wants to."

What kind of foremen do you have when the boss takes over specifically all the relationships from the foremen? In most cases I think we kid ourselves when we talk that way.

Management vs. Labor Organizer

So after a while, someone comes along and starts a union, starts to organize, and the management of the company say to themselves, "Who is this agitator? I wish there was some way we could legally run them out of town, but I guess we'd better write a letter to the employees or put an advertisement in the newspaper and tell them something ought to be done."

Management is a little angry by that time, so they put out something for the employees that indicates to this fellow who is trying to organize the place that they don't want it organized. That makes him mad, so he gains favor with the employees by telling them how bad the management is. That makes the management still more angry. Finally, the ill will that has been generated may result in a strike being called. If it doesn't reach the strike stage it will go to an election, and in a lot of cases the union wins.

Then you have to sit down in an atmosphere of hatred that has been built up by both parties, and work out an agreement. About all they agree to in that kind of situation is to be suspicious of each other, and they usually write that down on paper. They say on that piece of paper, "Now, I want to protect myself against that fellow and he is going to protect himself against me." So when you read the contract over you discover that 75 per cent of it is devoted to protection against the other fellow and an outline of what his suspicions of the other fellow are.

Unfortunately, however, they forget to include a number of things in the contract. So they spend the rest of the year fighting about these items.

I think a labor contract should be looked on as a sort of pact. It is a working agreement in which you are agreeing to a certain set of conditions whereby you live together, rather than a document to fight about. I'm afraid that too many of these labor agreements are on the basis of something to fight about.

There is another thing that I find so frequently in these negotiations, especially when they get into government hands. There is an atmosphere of a court trial about them. The management lawyer wins a concession, or he gets away with something with the union. That is good business, and you pat him on the back. Many times, enlightened self-interest would not dictate some of the things that are put into these agreements. All you do when you put into them some of the things that shouldn't be there is to sow seeds of trouble.

All I want to say is this: I feel that at this time we owe more to our country than merely the act of minding our own business. Up to this time I think this country's great success has been attained by everybody minding his own business; the people in the utilities and in the manufacturing industry rendering efficient service to the public, and by planning their own business efficiently.

But today I think that we are in such a critical state that we owe a little more. We owe a little of our brains and our thinking, and we owe it to ourselves and to our country when we get into these critical relationships with large groups of people, to be sure that we are on sound ground, to be sure that we are reasonable, to be sure that we are making a contribution to industrial peace, which in my mind is going to be the thing on which this country will either succeed or fail.

Revolutions and Roadblocks

(*Continued from page 232*)

One: A continued program of plant expansion.

Two: A vigorous, forthright, well-supported program of public relations.

Three: A willingness to fight, boldly and unafraid, for sound financial results.

Four: Acceptance of the simple fact that money rates are going up.

Five: Better organized, more inspired recruiting campaigns.

Six: An accelerated selling program that will bring more and more power to America.

Here is a program in the best tradition of the free enterprise system. It is bold, yet it is practical. It springs from the grass roots, the decisions of thousands of sovereign individuals. And yet its total scale is so tremendous that it dwarfs the ponderous bureaucratic programs of our rivals across the seas. For history has shown that progressive business programs like this have wrought a greater change in the world's way of life than had ever been dreamed of by the small-time revolutionists of today and yesterday.

That thoughtful statesman, Henry L. Stimson, seems to express the best in the American attitude at the close of his fine book, "On Active Service."

Mr. Stimson says, "Those whom I address now will mostly be younger than I, men of the generation who must bear the active part in the work ahead. Let them learn from our adventures what they can. Let them charge us with our failures and do better in their turn. But let them not turn aside from what they have to do, nor think that criticism excuses inaction. The man who tries to work for the good, believing in its eventual victory, while he may suffer setbacks and even disaster, will never know defeat."

"Go Forward"

There was a man in our industry who never knew defeat, in spite of setbacks and disappointments. He spoke to us last year, not from the speakers' table, but from an early motion picture that may well be one of the world's most treasured film documents. Perhaps you will recall the voice, as the aging Thomas Edison earnestly admonished us in that film of 1931:

"Be courageous. Be as brave as your fathers before you. Have faith. Go forward."

Who ever said it better than the old man?

Thirty Thousand Hours A Minute

By Gwilym A. Price
President, Westinghouse Electric Corp.

An Address before the Sixteenth Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 2, 1948

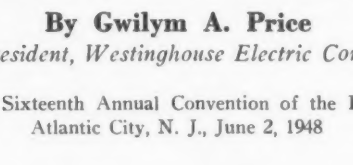
IF the last minute was typical of all the minutes that will tick by in the next ten years, it brought an addition of slightly more than 30,000 kwhr to the annual sales volume of your industry. Multiply that by 5,256,000—the number of times the second hand on your watch will go around in that decade—and you arrive at an increase of 157 billion kwhr, which will result in total annual sales of 374 billion. When that figure is attained, as we predict that it will be, the American public will be using in one day as much electrical current as it required in six months, in the earliest years of this century.

This forecast of a 72 per cent increase in your sales of power results from a study recently made to assist our company in its forward planning. Of course such predictions may not be made good at exactly 2:38 p. m. on the afternoon of June 2, 1958. The projections are on a long-term trend basis, with no attempt to time such cyclical swings as may occur. They are based on our assumption of the continuance of a high level of peacetime industrial activity and employment. Please mark that word—*peacetime*.

An Authoritative Study

This study was made by men who have spent their lives in this business. They have had the benefit of consultation with leaders in your industry and in other industries, and various governmental authorities. While we exonerate all of these friends of blame for our errors and responsibility for our optimism, we are more than grateful for their generous aid.

Within the next decade, the power-generating facilities of our country will need to grow to about 95 million kw. This represents an increase of about 80 per cent over the present installed capacity—an annual increase of over 4 million kw, even without replacement of obsolete equipment. And this is not all, because your systems will have to be expanded to handle this power. In the next ten years you may spend, for new construction, an amount equal to the present value of your utility plant after sixty years of growth.



MR. PRICE

What are the components of this expected increase in the use of electric power, which will challenge your industry's facilities and your management skill? Let me touch briefly on the major sources of the demand which we foresee—a demand based on the fact that there is no visible ceiling for American ingenuity and productivity or for American standards of living.

Naturally, improved living standards are a prime reason for the prediction that there will be a 73 per cent increase in average use by residential customers, while the number of customers increases by one-sixth. As a result, the readings on your residential meters should be doubled.

Next, there will be a great increase in the farm load. The number of electrified farms cannot be expected to continue the *rate* of increase of recent years. Nevertheless, we anticipate a 42 per cent rise in the number of your farm customers, to the point where 9 farm families out of every 10 in the nation will be benefiting from electrical service. The average annual farm load should go to 4,000 kwhr. On that basis, the sale of current to rural customers will be more than doubled.

Again, our forecasts show that the use of power by small businesses—industrial and commercial—will rise by more than one-half, while demand from the large industries and commercial establishments is likely to climb even more.

In this survey, we have tried to be hard-headed and realistic. The estimates are based, so far as possible, on fact; they are not mere extensions of curves of past performance. However, large as are these charted increases, we sincerely believe our predictions are on the conservative side. This is because numerous trends are at work—some that may be calculated with a fair degree of accuracy, some that are less tangible. Let me cite some examples.

Changes on Industrial Scene

First, there are conspicuous changes in the industrial scene. Some of these will add up to new or essentially new industries; all will build power system load, either directly or indirectly. Each entails the use of large amounts of steel, apparatus of many kinds, fabrications—all of which require for their creation a large amount of electric power. One extra-favorable circumstance about your business is that it stands to gain two ways from every new type of equipment, every new product. It takes power to build and equip the plant, as well as to make the product.

Consider the synthetic fuel program for example. Uncertain world affairs and the threat of declining petroleum resources make it appear inevitable that we shall see a new and gigantic industry created for the conversion of coal into liquid and gas fuels and chemicals. The first production stages of this announced program call for

plants to provide two million barrels of liquid fuel a day. The United States Bureau of Mines has indicated that in magnitude this will be five to ten times the size of the synthetic rubber program. It will call for many million tons of steel, fabrication facilities, and equipment of every description.

For another illustration, look to the steel industry, whose reserves of high grade iron ore are being depleted. Their problem is to treat low grade ores so that they may be brought up to equality with the better ores. This process requires great quantities of electrical energy. The power content of a ton of iron ore will be raised from the present figure of 4½ kwhr to 70 kwhr.

Another trend is found in the lumber and paper industries, which traditionally were self-sufficient as to power. Sawdust, bark and other wastes were more than ample to supply all the heat and power needed about the mills. Recently, however, progressive companies have been learning to convert these wastes into useful products. Many of these companies now will have to buy power.

While such changes in industry are somewhat startling, probably the greatest segment of load growth will come from expansion in more familiar fields. Industry's continued trend to electrification is a logical extension of the process which in the last twenty years more than doubled the kilowatt-hours per production worker. Every advance in the simplification of design, the higher efficiency of processing, and the substitution of the machine for the man's labor, marks another step in the same direction.

Speed-Up in Industry

Under the spur of rising labor costs and the general desire to increase productivity, many industries are increasing the speed of their processing lines. The new steel strip mills are operating at speeds of 4,000 feet a minute. Only ten years ago, 1,500 feet per minute was something to brag about. Tinning line speeds in some mills are being doubled. Kraft paper as wide as a two-lane highway is being made as rapidly as 2,000 feet per minute. One new mill, a few days after its initial operation, turned out a sheet of heavy kraft paper 19 feet wide, at the rate of nearly a thousand feet per minute for 36 hours without a break. That's 390 miles of paper—more than enough to cover a road from Pittsburgh to Atlantic City. Textile makers, glass manufacturers, and many others are also increasing the speeds of their processing lines.

While these speed records are interesting in themselves, they are doubly significant to you and to us because they entail additional electrical equipment and electric power consumption far more than the proportionate increases in speed. To double the speed of a processing line frequently triples or quadruples the power required.

Electricity in Transportation

But opportunities for increased power usage are not limited to manufacturing industries. Transportation, already one of the large users of electricity, gives promise for appreciable expansion in the use of electric power, not only for city transit systems but also for main line railroads.

As liquid fuel supplies diminish and costs rise, electrification of heavy traffic railroads becomes more attractive and can be expected to increase. In the same way, mounting costs of fuel and maintenance labor work to the disadvantage of engine-powered vehicles on city streets. Modern electric-driven vehicles are becoming more appreciated every day.

This transit load is a desirable one for the central stations, and they can do much to influence the wider use of electric power in urban transportation. Moreover, electric utilities have a recognized obligation to the communities they serve to help solve the rapidly worsening traffic problems. I am sure you are as concerned with the swarms of engine-powered "private plants" that crowd our streets, as you are with the "private plants" remaining in industry.

The answer to the traffic problem is not just to build more and better highways—for that only multiplies the automobiles and buses that use them—but in some greatly improved public transportation system capable of providing unusually high-grade service. Vehicles driven by your power are the best solution. Incidentially, about $3,500 worth of electric equipment installed in a trolley coach will, during its lifetime, use perhaps $25,000 worth of electric power. At a time when the use of electricity is growing in all other fields, it is illogical that it should shrink in the city transit field.

Many industries are just now becoming aware of the possibilities of high-frequency heating. As these develop, we may come to think of a high-frequency installation, not in terms of a hundred kilowatts or so, but in thousands.

While power companies must give their keenest attention to the new and expanded industries, they will not overlook the big though more prosaic job of modernizing existing manufacturing plants. In this connection, a little story about ourselves seems appropriate. You naturally would think—and so did we—that Westinghouse plants would be thoroughly electrified. But when our plant-planning engineers made a survey of our operations, they found that if we added all the new processes and machines which were justified for present production, our electric-power consumption would increase by 35 per cent. Perhaps some of you gentlemen who supply us with power are glad that the necessity of keeping our present equipment going and making deliveries, prevents our making this extra demand on you immediately and all at once.

Naturally, our conviction as to this ever-mounting industrial demand for power is based in part on what we see closest to us. That the electrical manufacturing industry has full faith in the future of *your* industry is emphatically shown by the steps these manufacturers have taken to expand their facilities. And, as a reciprocal measure, every such step means a further enrichment of your market for power.

Westinghouse Expansion

What our company has done in this respect is typical of our industry as a whole. Our postwar expansion program has resulted in nearly doubling our investment in plant and equipment, and in more than tripling our working capital. This has given us a productive capacity approximately three times that of prewar days in physical terms. We expect this process to continue. We believe, you see, in taking our own medicine.

Up to now, I have said nothing about the domestic load except to indicate our confidence in its continued growth. The forecast is for 2,400 kwhr per home per year, ten years from now. This is supported both by the realization that even the present

potential home load is four or five times as large as that, and by well-known facts of human behavior. Once a new electrical device is introduced into the home, it takes root. No captain of industry can possibly outdo the American housewife in enthusiasm for labor-saving machinery.

We need not dwell on such obvious, well-appreciated domestic-load builders as improved lighting, home freezers, air conditioners, dishwashers, electric bed coverings, radio and television, and the changed power-habits that have resulted from the automatic cycle washer and its companion, the drier. There may be more news value to you in some less common items, modest in their wattage consumption but potentially important in the aggregate.

New Load-Builders

Consider the germicidal lamps, which can be a potent aid in the prevention and control of colds, measles and other communicable diseases. These 15- and 30-watt lamps are a fine example of how tiny loads can build up to impressive totals. If just one such lamp were to be installed in each of the wired homes of the country, the aggregate addition would be 500,000 kw at 100 per cent load factor.

We are likely to see other now uncommon devices take place in the home, each helping to turn the disc of the watthour meter. Electronic recording devices may become a preferred method of "letter writing." Libraries may lend books recorded on films, to be read on microfilm enlargers which could become as common as telephones, placed conveniently about the house—and each equivalent in wattage to a console-model radio. Either as separate units or as adjuncts to television sets, facsimile machines may become an accepted household necessity—operating while the family is at the movies or asleep, recording news, weather reports, and other desired information. You may think we are drawing too greatly on our imaginations as to some of these items. But, if the past is any criterion, there will be those or other developments just as remarkable.

The more we delve into the source material of this forecast of power usage, the more conservative our estimates appear to be. Very quickly one ceases to wonder where the load will come from. The wonder is rather as to how the demand for power can be satisfied; will you be ready for these loads; can manufacturers build equipment rapidly enough; can it be installed soon enough; and the key question of all, will there be enough money to finance the construction program which must be carried through?

Here, too, we are optimists, and our studies give every encouragement. As to the industry's technical ability to carry through this program, there can be no question. This industry always has been one of great technical accomplishment, and it will continue to be.

As always, you will show continuously increasing talent in getting more out of your systems. At the same time, you will need, and you will get, consistent improvements in electrical apparatus. This improvement will not be by magic, but by step-by-step progress. Obviously, your operating experience and your consequent knowledge of your own requirements will be the primary guide for the apparatus manufacturer, who if he is wise recognizes that there are many things better known by the user than by the maker.

Our engineers tell me that you cannot safely count on atomic power to carry any major part of these loads which will come in the next decade. But there are other valuable aids. For instance, we have put into operation a device called the analogue computer. It will do almost everything human mathematicians can do, several thousand times faster and without error. With it, in only one year, we have been able to study more of the mechanical behavior of certain apparatus than in forty previous years. It will be a notable tool for you in studying power systems.

Standardization Lessens Cost

The greater adoption of standardization is going to help us all in building and installing more equipment. With standardized equipment, you can arrive at your goals less expensively and more rapidly. Some people said steam turbines simply couldn't be standardized. Last year, over half of the large turbines we sold were standardized machines.

In common with all industry, you face the problem of accelerated obsolescence of plant, due both to its wear and to the necessity for substitution of superior equipment. This situation may lead the utilities, as it has other industries, to adopt bolder programs of retirement of assets. This will call for understanding judgment on the part of the authorities who pass on rate structures and security issues. You cannot be expected to satisfy these vastly expanded power demands with the existing utility plant and treasury.

You may find it necessary, in the next ten years, to spend for new construction an amount equal to the present value of your plant. This is assuming that the dollar retains its present purchasing power. If the price level goes up, your financial requirements will rise accordingly.

Investor Apathy

In most periods of our national history, any industry which could point to such promising markets as those which lie before you would have found investors clamoring for its securities. That this is not now true, for your business as for others, is sorry evidence of what is wrong with our present economy.

Capital expansion since the war, the greatest in peacetime history, has been financed up to now almost entirely out of industry's own funds and its borrowings. The water is running low in both reservoirs. So we look to venture capital to prime the pump for the future; and we find that the trickle from that stream supplied only 2 per cent of capital expenditures in 1947. That was a flourishing year, too, when corporate profits were said to be so enormous that, surely, any wise investor should have been speeding his money into the stock market so that he might share in the harvest.

I touch on this topic just long enough to make these observations:

1. Venture capital will not go to work for today's starvation wages—by which I mean the meager net cash return after corporate and individual taxes are paid.
2. The simplest and fairest method of raising those wages is to eliminate the double taxation of dividends, by making them free of tax on the stockholder.
3. This would result in large-scale investment, reduced debt and fixed charges, enlarged and modernized productive facilities, lower costs and prices, higher living standards, and continued full employment.

(*Continued on page 257*)

Taxes and the Stockholder

By Lee P. Stack

Vice President, John Hancock Mutual Life Insurance Company

An Address before the Sixteenth Annual Convention of the Edison Electric Institute, Atlantic City, N. J., June 2, 1948

YOU have asked me to discuss the difficulty of selling stocks today and the relation of our tax structure to that resistance. I believe our tax system to be practically the whole difficulty.

On April 1, Mr. Dewey made a speech in Wisconsin, the title of which was "We Are Facing The Gravest Crisis in Our History." That talk was made on "All Fools' Day," and dealt with foreign affairs.

On April 3, in Wisconsin, Mr. Stassen stated as one of his planks "A favorable tax system so that the incentive is always present to everyone to invest and earn and produce." There were other issues, but the fact is Stassen triumphed, although Dewey carried the state overwhelmingly four years ago.

In April 1944, the late beloved Wendell Willkie was making a remarkable run for the nomination until he made a speech in Wisconsin calling for raising individual income taxes from $8 billion to $16 billion. He sealed his doom. The farmers of Wisconsin are good businessmen.

The Inflation Menace

On January 7, President Truman in his message upon the state of the Union said: "We are today far short of the industrial capacity we need for a growing future. At least $50 billion should be invested by industry to improve and expand our productive facilities over the next few years."

$50 billion is probably an understatement.

On April 17, he said:

"Inflation is a grave menace to this Country and to the World."

Now the President is not a lone voice in the wilderness preaching the hell-fire of inflation. Outside of the clergy, practically every orator who mounts a rostrum has something to say about inflation. Every cracker-barrel economist is lecturing upon not the imminence but the presence of inflation, and the danger of permitting it to progress further.

MR. STACK

Scarcity of goods accompanied by a money supply sufficient to bid up prices brings inflation. On April 1, *Collier's* said editorially:

"There are various fancy and allegedly painless, perspirationless ways to attack inflation; but the hardpan method which gets the fastest results is to bring production of goods closer to the total amount of money bent on buying goods."

Now we branch off and from here on there is not even agreement among people engaged in the same pursuits. The Tower of Babel starts when we discuss cause and cure. Some management claims it cannot get material, either for production or for expansion. Some management thinks labor is not delivering full effort. At one time labor will claim management is making too much profit, while other spokesmen say management should expand its plant.

Washington says wages but not prices should be raised. Again Washington says there is too much money around and to prevent inflation taxes should be raised and the people should buy more bonds. Eccles says the banks should post more reserves and that we can stop spending that way.

The banks reply that they are trying to steer their loans into channels which will increase production of scarce items, and to give the Federal Reserve additional reserves would only cramp their ability to aid in stimulating production; or it would cause them to sell Government Bonds and further hinder the Treasury in its effort to maintain low interest rates. Mr. Snyder didn't need that last hint, for he was already out trying to sell more bonds to individuals. You can get scores of other answers to the problem because the answers seem to depend upon the occupation of the answerers.

We are not being honest with ourselves. We are all having fun at the good old American game of "passing the buck" but the fun is running out, and we are playing loosely with the greatest stakes in history. The incomparable greatness of America rests squarely upon its capacity to produce and we are gambling, if not, indeed, betraying that productive capacity.

Four Important Thoughts

Let us go back for a moment to our candidates. The three living candidates have contributed four important thoughts. We probably can with all justice compound their four contributions into one sentence. Pardon me for taking liberties with words of three such illustrious statesmen, but I would reshape their statements into one sentence, as follows:

"We face the gravest crisis in our history because our tax laws destroy the incentive to invest and earn and produce; therefore, we are short 50 billion dollars of productive capacity, and as a result inflation constitutes a grave menace."

We are woefully short of facilities to manufacture scarce goods. We do have money, hence the inflation. Nothing is to be accomplished in whining over our predicament or spending our time blaming one another for the situation. The important question is —Where do we go from here?

Why should anyone want to build these plants with our graduated surtax staring him in the face? Should the venture succeed, the surtax would reap the reward and should it fail, the owner would lose his shirt. Neither is there reason to buy stock in a corporation contemplating the same venture. If successful, 38 per cent will go for Federal taxes and there might also be a State corporation tax, after which the stockholder would still be subject to high brackets tax upon his dividends. The bulk of such venture capital once came from wealthy citizens who enjoyed a considerable surplus each year after payment of their taxes and personal expenses.

For instance, in 1916, the 40,000 people paying taxes on incomes of over $25,000 annually, had left net income after taxes, $3.2 billion. By 1929, this had grown to 103,000 individuals with $7.3 billion after taxes. Now this group, unless it had foresight to get some tax-exempt bonds, cannot meet its living expenses without resort to sale of principal.

Where is Venture Capital?

The prospect is no more cheerful when we drop down a peg. Comparing 1936 and 1946, of the persons with $15,000 left after payment of Federal Income Taxes, there were only 17 per cent as many in 1946 as there were 10 years earlier; and in 1936, the depression had not ended.

There is no use going further down the scale in search for venture capital. Studies have shown that where incomes are under $10,000 the savings are routed into banks, insurance policies, building and loan shares or savings bonds.

After double taxation by the Federal Government, most stockholders also pay a State Income Tax. In my own state we pay 6 per cent upon unearned income as contrasted with 1½ per cent upon wages.

Eighty per cent of Federal Income Taxes are derived from net income of $5,000 and less, so that there is no question but that the Government can afford to lower the top brackets in order to bolster our whole economy by releasing risk capital to create capacity and wages. The surtax rates on incomes over $100,000 only supply 4 per cent of the total collections.

In 1929, the head of a family enjoying $200,000 net income paid a top bracket of less than 25 per cent. In that year nearly $6.5 billions of new security issues were placed and 63 per cent of that amount represented stocks. In 1947, the same income suffered a top surtax rate of 85½ per cent and while $4.75 billions of new issues were publicly placed, only 25.9 per cent represented stocks. This latter percentage would be greatly reduced if the so-called private placements which were, practically speaking, all bonds, were added to the 1947 total.

When the surtax rates were low, your prosperous American welcomed risks—he thrived upon them. He was prosperous to begin with, because he had been successful in measuring the degree of risk against the measure of reward. The rank and file tried to emulate the man who had arrived, because then our tax laws permitted the accumulation of an estate. In those days there was no excuse for an American dying a poor man and he rarely did, unless he was mentally maimed or a confirmed alcoholic.

Now our people take no chances because there are no commensurate rewards. Such a system will wreck any nation. If small amounts are saved, our people immediately take them and run to cover.

After nearly 100 years, we Americans had built up deposits, at the end of 1935, in our mutual savings banks of $9 billion. Now we have over $18 billion only 12 years later. A cheapened rubber dollar? Yes, but make all the allowances you choose and you do not destroy the significance of that comparison.

Savings Pile Up

In our commercial banks, the savings accounts, or so-called time deposits, at the end of 1935 were $11 billion. In January of this year they were over $35 billion.

Postal Savings, while not large in the aggregate, are up 160 per cent from 1940. Let us look at the currency held outside banks. After the First World War in 1920 (a year of loose spending—at least we thought so then) the currency held by those other than banks was a mere $4 billion. Now it is over $25 billion. True, we need a lot of money today to make the wheels go round with these prices, but much of that money is being used to circumvent the tax gatherer.

In 1933, the total assets of all life insurance companies in the United States was something over $20 billion. Today they amount to approximately $52 billion.

We are now witnessing a situation where resistance is encountered when attempting to sell stocks, even by old established concerns. Several utility stocks require an income basis of 7 per cent to 8 per cent to successfully market them. There were at least two cases where no bids were received for stocks of important and well established electric companies.

There is good appetite now for bonds, but practically none for stocks, for the simple reason, as just illustrated, Americans have changed their habits of thrift. Such a freak situation is anything but healthy. Being thwarted in his efforts to build up a competence, the individual is turning to pension funds for his old age and putting the rest of his savings into avenues largely free from risk. A trustee cannot accept risks when handling the funds of others. If his conscience fails to dictate this course of action, then the statutes do.

Danger in Competitive Bidding

An obstacle of less importance than taxation to successful placement of stocks is the competitive bidding system. It works well when there is an avid appetite for securities—the one danger then being that the securities are over-priced, which is quite likely to injure the issuing company's credit later on. The system, however, has yet to prove its efficacy in periods of apathy on the part of buyers. The public works up a voracious appetite for stocks only in widely separated intervals—1919, again 1928-1929 and in 1945 and early 1946. Then it subsides for years. During the lulls genuine hard work is required to place stocks successfully. Syndicate managers now have a hard time recruiting members to bid competitively. A great deal of statistical work should be done, followed by an educational campaign to enthuse partners and salesmen, then price meetings. At this stage, participants begin to drop out, fearing the prices to be too high, and, indeed, many houses decline the invitation at the outset, feeling that the time and effort could not be justified, since several groups would bid and the odds being that the effort would be wasted. If in the judgment of some organizations, the issue appears "sticky," they sell the shares short, thus complicating the work of the

enthusiastic group with the winning bid.

One of the most helpful policies pursued by the American Telephone and Telegraph Company in financing the world's largest corporation was to always give the investor a break. This company never consciously over-priced its issues and the investing public was always receptive to new securities of the system.

So there is money for bonds, notes and bank loans but little for equities. At least there has been in the recent past plenty of money for fixed obligations. To insure the constancy and adequacy of this supply, however, the people must first save it. In 1944, they put into savings bonds, insurance and savings accounts, around 35 billion dollars; in 1945, 29 billion (both war years when they could not buy the things they wanted); in 1946, these items dropped to 17 billion and last year probably around 10 billion. The latter figure is not large when construction of new homes is taking more than that sum annually, and this construction should run heavy for many years, because we now have 13 million more family units than we had in 1940.

Government at Cross-purposes

Indeed, there were months in the latter part of 1947 when the funds for fixed interest obligations were inadequate and Government Bonds were sold by both insurance companies and banks. We frequently hear of one arm of our government working at cross purposes with another, but it is really "man bites dog" news when a department of the government finds two angles to play one against the other within its own jurisdiction. The Treasury is fighting hard to maintain a 2½ per cent rate on long bonds. At the same time, the Treasury resists efforts to reduce surtax rates which, if done, would unleash a flow of money for stocks. Should this occur, corporations would quickly accept the invitation because they have had to borrow altogether too much. No sane management will willfully continue to distort its capital structure to the point of ultimately risking the solvency of its company. Then with fewer debt issues available, we trustees would be forced to bid for the declining amount, thus giving Mr. Snyder or his successor a lift by concentrating our purchases upon a scant supply.

Taxation of capital gains raises little in the way of revenue and doesn't make sense anyway. Profits are not income and never were. No other nation on earth ever thought so until this country conceived the idea of taxing them. The elimination of this tax would add substantially to the attractiveness of stocks.

Industrial Encouragement in Canada

Canada does not tax profits and in addition follows one of the most enlightened policies with respect to obsolescence and depreciation. The Dominion encourages its industry to keep modern and in shape to compete in world markets.

I recall another tax system which seemed good. Colbert, who was Louis XV's Minister of Finance, stated his system tersely, as follows:

"In raising taxes, the idea is to so pluck the goose as to get a maximum of feathers with a minimum of squawks."

We call this a free economy and something like 99 per cent of us vigorously contend that it is worth saving. To really define it, we have to compare it. The Egyptian and Roman Empires rested upon a mixture of political and social status, together with armed force and slavery. Feudalism was some improvement over outright slavery and lasted hundreds of years and then failed. The rewards were for the most part for military prowess. The few who enjoyed any comforts received them either through inheritance or for extraordinary achievements in war. There was no premium upon hard work and ingenuity.

The military dictatorships of Hitler and Mussolini did not remain upon the pages of history long enough to deserve comparison. With their so-called labor fronts, they did regiment labor under direction of the State and did tax to the limit. At least in the cases of Germany and Japan, businessmen built the greatness of the countries later to be wrecked by complete state control followed by inevitable military conquest.

The present Russian system has lasted 25 years and with our help has now become the world's second power. Lenin in setting it up gave the franchise largely to industrial workers. They had a five-to-one vote ratio as compared to farmers. The right to vote was denied employers of labor and to persons whose income consisted of interest and rents. In its attempts to become a great industrial producer, Russia uses some of our methods, such as increases in wages and a system of bonuses. However, as people begin to accumulate money, it is taken away from them by devaluation as we have just witnessed.

During the war government bonds were used to sop up loose money but then politically well organized campaigns succeeded in having most of such bonds patriotically donated back to the government. With State control of production and distribution, the individual holder of money has little freedom in the uses he may make of it. After a quarter of a century, Russia has not begun to match our production nor our comforts to its citizens. However, if we by inaction slip into state capitalism, Russia will have had a start of many years upon us. While their present system cannot and never will compare with our old system, if we continue to drift into a form of theirs, they might have a distinct advantage.

Freedom of Decision

History is conclusive that tremendous economic ability goes hand in hand with freedom of decision and action by the individual. Private capitalism builds a factory or an engine, state capitalism builds pyramids or war machines. Since the war two countries of former greatness are busily engaged in seeking remedies for the decrepit and obsolescent condition in which their industrial capacity has fallen. The war accelerated but did not produce these conditions. Studies by the Labor Party in Great Britain and by the Monet Commission in France show that this creeping paralysis had its beginning before the First World War.

We probably understand Englishmen, their thoughts and psychology better than other mentalities, so let's draw some comparisons from their experiences.

Some years ago a British investigator, a Mr. Rostas, gave figures to prove that output of the American worker was 2.3 times that of the British laborer in several comparable industries. What he did not show, however, was that our men in these industries averaged only 36.3 hours weekly and the Englishman averaged over 47 hours. Upon a manhour basis, the output of our worker was three

times that of the Britisher similarly employed. Isolated cases show even wider disparity. Our iron and steel output was five times greater; and the same ratio applied in the manufacture of motor cars. In radio sets it was six times. In coal three and one-half times. Even our cows caught the spirit and their output was 21 per cent greater per cow than in England.

Even Joe Stalin publicly admitted that his country could not have given as good an account of itself in the recent war without the phenomenal efficiency of American industry. Five illustrations will suffice to explain our efficiency. Invested capital per employee for General Motors is over $5,000; Standard Oil of New York upwards of $13,000; in the Pennsylvania Railroad $7,800; American Tobacco $25,000 and in Consolidated Edison of New York, the investment exceeds $39,000 per employee. By furnishing our labor with such advantages, it enjoys the shortest hours and highest living standards on earth. Americans, it is said, own over 80 per cent of the world's insurance, automobiles, telephones and bathtubs.

England failed to keep its industry up to modern and efficient standards. Now not even the Government can finance the transformation unless we help.

A British coal car holds about 12 tons and ours carries 50 tons. The English coal trains will carry about 30 to 40 cars and ours carry around 100 cars.

The British Platt Report on Industry

As to the cotton spinning industry in England, the Platt Report made by the Labor Party in 1946 says: "Conditions throughout almost the entire British cotton weaving industry are basically similar to those which existed 40 or 50 years ago." In the Woolen Report, page 76, made in 1946, is this statement: "Some of the woolen carding machinery in use is over 80 years old. Many of the looms have been in use 50 years or more." It is interesting to compare here that in America, 70 per cent of the looms are automatic, compared with 6 per cent in Great Britain.

In the lace industry the Report made by the Working Party stated, "Less than 3 per cent of the present machines have been installed since 1923." In the woolen textile industry it came out that 77 per cent of the buildings were constructed before 1900; in cotton spinning the percentage was 61 and in the cotton weaving industry, the percentage in 1946 was 67.

The chief reason the British lost interest in keeping their plants modern was taxation. The *London Economist* has said, "It is common knowledge that the present cruelly high tax rates of direct taxation kill every incentive except that of tax evasion." There you are.

The Working Party in its Report on the pottery industry on page 53 said, "We are convinced that depreciation allowances for income tax purposes have a direct bearing on the conduct of an industry; and that there is close association between the small prewar allowances and the continuing employment of antiquated buildings and processes."

Limits to Taxation of Earned Income

There is a lesson in that statement and bear in mind, please, it is advanced and approved by Britain's Labor leaders.

From 1896 to 1918 no depreciation allowance upon buildings was permitted in the English tax system. From 1918 to 1945 the allowance was 1 per cent per annum. If a building were scrapped, no loss was recognized between the original cost and the amount of depreciation previously set up.

In its Cotton Report, the Working Party recommended: "In view of the great rise in prices, the values on which wear and tear allowances for plant are based should be recalculated so as to bring them into relation with current replacement costs."

To quote the *Economist* again: "There is a limit beyond which the taxation of earned income should not be carried, a limit that is greatly exceeded at the moment."

The British have in their income tax laws an equivalent to our Section 102, and with the latter you are all familiar. The Woolen Textile Report to the government in discussing the need of plowing back greater sums for re-equipment had this to say: "The difficulty facing a company is not merely its liability to surtax (which of itself reduces resources plowed back into business) but the uncertainty that it may have the whole of its profits for a period of 6 years assessed to surtax if it is deemed by the Special Commissioners to have distributed in dividends less than a reasonable part of its profits."

In America we have practically, if not quite, reached the extremes of British taxation. The great difference is that we only during the war reached the peak whereas England has been administering a misguided tax policy since the First World War; and in view of its bitter experience, the time to save our industry is now.

For those who believe it good policy or even selfish policy to tax the wealthy out of productive enterprise, let them ponder the plight of England today. You can tax the rich to pay doles to the poor or shiftless and no doubt it is good fun for the recipients while it lasts. Now, practically speaking, there is no wealth left in Britain to tax and since the cancer of high taxation and resulting obsolescence has eaten away much of its capacity to produce wealth, its citizens have not enough of food, clothing or warmth. It is probably with some justice that facing up to this situation is being done by a government representing the segment of people responsible for the ruinous taxes and doles. It will be a long and painful process. We have in this country a high degree of intelligence among our labor leaders and while time is running out, there is yet sufficient of it to permit them to perform a really statesmanlike service for their followers and spare them and their children the unnecessary tragedy suffered by their British cousins.

Taxation Does Not Correct Basic Differences

The scarcities which now plague us are only partly a result of the war, but more directly the result of making it unattractive to our citizens to enter into or continue productive business. The "soak the rich" enthusiasm has reacted with greater violence upon the poor. To realize this, one has only to consider the cost of commodities and manufactured products today. The rich are not rich because the poor are poor, and the income tax will never correct the difference. Many of you recall the 1947 Gallup poll showed an overwhelming majority, of all income groups, opposed to high surtax rates.

How can our workers improve their lot when the body politic is absorbing the savings which should be going into factories, ships and machinery to give employment and produce more

goods? Fewer factories can't raise wages or lower prices.

One encouraging sign, although dim as yet, is that the businessman occasionally now gets a slight nod of recognition in Washington. He has been in the dog house a long time, and is not out yet. He is the fellow who made this country commercially and industrially great; as was also the case in England, Germany and Japan. There are plenty of laws to take care of crooked businessmen and those who team up to take advantage of their fellowmen, and we are completely stupid if we do not give the honest ones a little rein. The best way to do so is to apply taxes in a manner to give them an incentive to accomplish something. We must not tear down the splendid temple erected by our forefathers in order to stamp out a few cockroaches living in the darkness of the basement.

Difficulties of Selling Utility Stocks

We might also give the workman some incentive or at least remove the incentive to loaf. The word "Security" is being construed as the right to loaf.

One cannot say that the difficulties of selling stocks in your industry is peculiar to the electric industry or that the difficulty has yet been increased by governmental competition. There is, of course, danger of this, should the TVA principle be expanded. An undertaking operated by the State does not worry about insurance, depreciation, obsolescence or even operational losses, because additional taxes can be routed into the operation once it is established.

You may logically ask why with the same but greater shortages present there was an excited flurry in and good demand for stocks in 1945 and 1946. The principal reasons were probably these three:

1. An acute shortage of goods caused people to temporarily buy stocks because it seemed to be a rising market.
2. There was a shortage of tax-exempt bonds brought about by the inability of states and municipalities to do any work during the war. The very high prices for these tax-free obligations caused many holders to sell them and employ the proceeds temporarily in the stock market. Again because they felt it was a rising market and upon capital gains they would only pay a 25 per cent tax. Now these people are out of the stock market and back into their non-taxable bonds which yield approximately 40 per cent more than when they sold them.
3. The yields on corporate bonds were also driven to a very low level by scarcity and many insurance companies, hoping to better cover their reserves, entered the stock market—largely for preferred shares. Since that time these companies have revised their reserve requirements and, secondly, the bond market affords them somewhat better yields now, and with these two changes in circumstances they are not inclined to reach for yield in the form of stocks.

These effects were temporary and are now history. The main complaint has to do with fundamentals which still plague us.

There is no doubt but that double taxation, high brackets and the capital gains tax are the chief obstacles in the way of coaxing equity funds or risk capital into the American economy—where, by the way, it is sadly needed.

Sales Training Film On Home Lighting Released By E.E.I.

A NEW sales training film on home lighting, entitled, "Lighting the Home the Sunshine Way," has just been released by the Edison Electric Institute. A supplement to the Institute's Sales Training Program of 18 sound-slide films and supporting materials, the new film was prepared in answer to numerous requests from utilities, electrical leagues and others. It applies the basic sales techniques taught in the course to selling residential lamps and fixtures, and is expected to prove highly effective in training lighting sales personnel.

Featured in the film is a case history of the re-lighting of a typical living room, with many lighting faults commonly found in the average American home. "Betty Smith," the lighting representative, analyzes the illumination, and points out to the homemaker the harsh shadows, glare from unshaded lamps, bulbs inadequate for seeing tasks, and other flaws.

Discussing each in turn, she appeals to the housewife's buying motives as she has learned to do in the E.E.I. course—to "pride and prestige," by showing how good lighting will improve the room's appearance; to "comfort and convenience," by proving how poor light hampers the family's enjoyment of their home, and to "health and safety," by showing how eyestrain and its accompanying ills are often caused by inadequate light.

Step by step, she establishes the family's need for modern illumination. The representative then leads the housewife through the sales process taught in the Sales Training Program, and works out the changes and new lighting equipment needed to assure good light. The film then shows the living room when it becomes a real "Sunshine Room," with the recommended correction for each original lighting fault shown in detail. Other rooms in the average home and their lighting needs are also shown.

Four basic principles of good home lighting emphasized in the film for utility and dealer sales personnel to follow are listed as:

1. Provide enough light for each task.
2. Eliminate glare.
3. Avoid harsh shadows.
4. Assure balanced light, over the entire room.

"Lighting the Home the Sunshine Way" has been prepared for use in training lighting advisors and sales people of electric companies, retailers, contractors, department stores and others concerned with the sale of lamps, fixtures and lighting equipment.

The film was prepared by Edison Electric Institute, in consultation with the National Electrical Wholesalers Association. Films and records are available from the Institute, 420 Lexington Avenue, New York 17, N. Y., at $30.00 per set.

The set includes a leader's guide for the person conducting meetings of sales trainees at which the film is shown, and a silent trailer film, for discussion purposes. Manuals covering the sales principles and ideas presented in the film, which are intended for distribution to those attending the meeting, are available at 75 cents each.

Rural Electrification From the Power Company Viewpoint

By Grover C. Neff
President, Wisconsin Power and Light Company

An address presented before the Midwest Power Conference, Chicago, Illinois, April 8, 1948

IN THE early 1920's, the electric utility industry in the United States was completing the greatest system of electric transmission line networks in the world. These lines were carrying electric power 24 hours a day from strategically located and efficient generating stations to practically every city and village in our country. The foundation was laid for the beginning of farm electrification on a national scale. While some farms had electric service prior to 1920, no large-scale farm electrification program could be carried out until the cities and villages had dependable 24-hour service.

The farm electric lines naturally radiate from these cities and villages, and such farm lines could not be efficiently and dependably energized until electric power in sufficient quantity was available in each of these urban centers. So, while few farms were served prior to 1920, the investment made by the power and light companies in utility property prior to that time was essential to successful farm electrification in the United States. It formed the foundation on which rural electrification could be built. It provided a supply of dependable, low-cost electric power at a center in each farm area.

The utility industry began in earnest to start a national rural electrification program in 1922 and, by 1930, had made electricity available to about one million farms. The depression stopped all expansion for about 5 years, at the end of which period the utilities again resumed the extension of rural service.

In 1935 the REA was created and, since that period, it, too, has been active in extending service to farms of this nation.

Present Status of Rural Electrification

The latest available Census figures on the number of occupied farms are for January 1, 1945. New Census figures will not be available until late 1951, and they will be for January 1, 1950. We will assume, then, that the number of occupied farms today is the same as it was January 1, 1945. That number is 5,600,000. The number of farms receiving electric service from power and light companies, as of December 31, 1947, was 2,082,316. The number of farms receiving electric service from REA co-ops was 1,533,894. The number of farms receiving electric service from all other agencies was 200,890. The total number of farms receiving electric service on December 31, 1947 was 3,817,100.

In the U. S. Census figures for January 1, 1945, it was shown that 856,000 farms were located either along existing lines or within ¼ mile of such electric lines, but, for one reason or another, were not taking service. Since that date, undoubtedly a number of these farms have been connected to these lines, but, on the other hand, many thousands of miles of lines have been extended into new territory, and it is the best estimate of the experts at Edison Electric Institute that, at the present time, there are about 725,000 farms that are not using electric service but have been reached by electric lines.

Evaluation of Farm Figures

From the above figures, it appears that 4,542,000 farms in the United States have been reached with electric lines and that 3,817,100 of these are actually using electric service. If from the total occupied farms in this country we deduct the number already reached, we see there are about 1,058,000 farms in the United States that are located more than ¼ mile from existing farm electric lines. At the present rate of expansion of farm electric lines, approximately 45 per cent of these 1,058,000 farms will be reached during the year 1948, so that the job of farm line building, which has been going on at a rapid rate to carry electric service into new areas, will have to slow down after this year.

In the year 1947, the electric power and light companies sold at retail over 6 billion kwhr to the farms served by them. In addition, they sold wholesale to the local co-ops about 2 billion kwhr, which were, in turn, retailed by these co-ops. The amount sold wholesale by the power and light companies to the local co-ops was about 55 per cent of the co-ops' total electric requirements.

Power Supply

There has been considerable discussion about the adequacy of the supply of power from generating stations in this country, which affects not only the farmers but urban customers as well. A brief review of the power supply situation seems in order.

Prior to World War II, the power and light companies of this country maintained a reserve in their generating plants of 20 per cent or more. During World War II, the normal program of these companies for adding to their generating capacity was interrupted, because of the shortage of men and materials. While the loads continued to grow, relatively little generating capacity was added during the war years. Even after V-J Day, it took some time for the manufacturers of generating equipment and other utility equipment to get their plants converted and producing this equipment in large quantities.

It was not until 1947 that turbogenerating equipment began to flow from these factories in sizable amounts. About 3 million kw of generating capacity were delivered by manufacturers in 1947, the major portion of it in the last 6 months of that year. The rate of delivery in the last quarter of the year was greater than the rate of growth of power consumption. Ap-

proximately 2 million kw of generating capacity were installed and put into operation during the year. However, the growth of load during the year was 4 million kw. This narrowed the margin of spare and reserve capacity from 5,300,000 kw, at the beginning of the year, to approximately 3,300,000 at the end of the year.

According to present plans and expectations there will be added in 1948, 5 million kw of generating capacity, and the estimate of increase in customers' loads is 3,500,000 kw. These additions will materially improve the margin of reserves, but will leave in some sections of the country a closer margin than desired. The reserves at the end of 1948 are expected to be larger than they were at the end of 1947 by 1½ million kw.

During the 4 year period, from 1948 to 1951, inclusive, the electric power and light companies of this nation plan to spend about 6 billion dollars for new utility property and add another 15 million kw of generating capacity. Orders have been placed for all of this equipment, loading the manufacturers of such equipment to the limit. This expansion program is designed to keep ahead of the estimated growth of load and to re-establish, by 1951, a normal reserve margin.

It is believed that the power and light companies of this nation will be able, with some minor exceptions, to supply throughout this critical period all of the electrical requirements of their customers, both wholesale and retail. This means that these power and light companies, which furnish at wholesale about 55 per cent of all the energy resold by the local co-ops, will be able to furnish such co-ops with all of the energy they require to take care of their customers. In a number of cases, inadequacy of power at the farm has been charged to inadequacy of power supply at the source, whereas the real difficulty has been inadequacy of the farm distribution systems.

Capacity of Rural Distribution Lines

During the stage when a rural distribution system is being rapidly expanded a rather large area can be carried on one single-phase line and its associated branches. As the customers increase their load demands additional phases can be added to the main feeder and the area subdivided into sections supplied by different phases. Inasmuch as voltage regulation rather than ampere loading is the usual limiting factor, the addition of voltage regulators in the line provides a method of securing a certain amount of increase in load carrying ability.

East of the 100th meridian the national average farm consumption is now about 1,855 kwhr per year and there are local areas where the consumption is two or three times as great (exclusive of those where irrigation is required). Handling these heavier loads will frequently require reducing the size of area supplied from a single substation. This involves establishing additional substations supplied by higher voltage subtransmission lines at locations selected with due regard to future rural line extensions and load growth. Considerable attention has been paid to simplification and standardization of substation design for minimum material and construction cost.

Therefore, one of the big problems for the rural distribution engineers is to make a complete study of the rural distribution systems in which they are interested. First, to determine the

National Farm Electrification Conference Scheduled For Chicago, Nov. 17-19

THE third annual National Farm Electrification Conference will be held November 17, 18 and 19, at the Congress Hotel, Chicago, Ill., it has been announced by Frank E. Watts, Conference Chairman.

Mr. Watts, who is director of the Rural Electric Informational Exchange, said that this year's Conference will be extended to a three-day meeting, rather than two as previously held, in order that more time may be devoted to discussing agricultural problems, and "the methods which farmers might employ to solve them electrically." As in past years, the program will feature forum discussions and addresses by outstanding speakers from industry, government, agriculture, education and publishing.

Among those scheduled to be heard is Congressman Clifford R. Hope, of Garden City, Kansas, Chairman of the Agricultural Committee of the House of Representatives. Mr. Hope, it is expected, will bring the meeting to a close with a luncheon talk on the final day.

Six Regional Vice-Chairmen have been added to the Steering Committee, or official governing board of the Conference, Mr. Watts said. They are: R. B. Corbett, Associate Dean and Associate Director, University of Maryland, College of Agriculture, College Park, Md.; J. B. Rodgers, Head, Agricultural Engineering Dept., Oregon State College, Corvallis, Ore.; P. D. Sanders, Editor, *Southern Planter*, and Master of the Virginia State Grange, Richmond, Va.; P. T. Montfort, Research Associate, Agricultural Engineering Dept., Texas A & M College, College Station, Texas; H. E. Slusher, President, Missouri Farm Bureau Federation, Jefferson City, Mo., and E. G. Stahl, Manager, Agricultural Sales, Pacific Gas & Electric Co., San Francisco, Calif.

In addition to Mr. Watts, the Conference officers are C. D. Leiter, Sales Manager, F. E. Myers & Bros. Co., Ashland, Ohio, Vice Chairman, and Frank R. Innes, Associate Editor, *Electrical World*, New York City, Secretary-Treasurer. The program for the 1948 meeting is under the direction of George A. Rietz, Manager, Farm Industry Div., General Electric Co.

The Conference now has twenty-one national organizations as participants. These are:

Agricultural Education Service (U. S. Office of Education), American Agricultural Editors Assn., American Farm Bureau Federation, American Home Economics Assn., American Institute of Electrical Engineers, American Society of Agricultural Engineers, American Society of Mechanical Engineers, American Washer and Ironer Manufacturers Assn., Associated Business Papers, Inc., Canadian Electrical Manufacturers Assn., E.E.I., Farm Equipment & Wholesalers Assn., National Association Domestic and Farm Pump Manufacturers, National Board of Fire Underwriters, National Conference of Business Paper Editors, National Electrical Contractors Assn., National Electrical Manufacturers Assn., National Electrical Retailers Assn., National Electrical Wholesalers Assn., National Retail Farm Equipment Assn., Vacuum Cleaner Manufacturers Assn.

loads these lines will have to carry, say 5 or 10 years from now; second, to decide what steps should be taken to give the networks now built sufficient capacity to carry these loads; and, third, to lay out a program of construction so that the necessary feeder lines and substations will be completed in time to take care of the loads as they increase.

6,000 Kwhr Average Future Load

In the year 1947, the farmers served by utility companies in the area east of the Mississippi River used an average of 1,855 kwhr. In 1944, 1945, and 1946, the average kilowatthour consumption was 1,461, 1,571, and 1,669, respectively. This shows an average increase of 8.3 per cent per year.

Among these customers there were many thousands of farmers whose only sources of income were their farms, who used more than 6,000 kwhr per year. These farmers found it profitable and to their advantage to make use of this amount of service. It has, therefore, been demonstrated that a farmer on an ordinary farm can use with profit 6,000 or more kilowatthours of electric service per year. It seems to me, therefore, that in making plans to increase the capacity of farm distribution networks in the East North Central Area we should assume an average use of at least 6,000 kwhr per year, or 500 kwhr per month. We will certainly attain this average load in 10 years, and in many sections it will be reached earlier. Any plans made for increasing the capacity of these distribution systems should look ahead ten years. My suggestion, therefore, is that a careful study be made of each area and an honest appraisal made of the probable loads 10 years hence, this to be followed by engineering studies to see what must be done to bolster the existing farm distribution systems, so that proper service will be supplied when that load is reached. Many companies have done this, but some have not.

Midwest Farm Load Study

We have made a study of the loads of 2,200 farm customers of Wisconsin Power and Light Company served in Green County, and have estimated the probable new equipment and appliances that will be installed by these farmers by 1955. From this study we have developed the following table:

ESTIMATED FARM ELECTRIC UTILIZATION
GREEN COUNTY—1955

2,200 Customers

	% Sat.	No. Farms	KWHR	Total Annual KWHR
Poultry Production				
Night Lighting	75	1650	35	57,750
Brooding	60	1320	300	396,000
Water Warmers	50	1100	100	110,000
Ventilation	10	220	200	44,000
Dairy Production				
Pasteurizer	40	880	350	308,000
Milker	90	1980	250	495,000
Dairy Water Heater	50	1100	1200	1,320,000
Stock Tank Heater	10	220	300	66,000
Milk Cooler	20	440	1200	528,000
Home Food Production				
Freezers	60	1320	1800	2,376,000
Roughage Crops				
Hay Driers	5	110	3000	330,000
Hay Hoists	25	550	30	16,500
Blowers	15	330	300	99,000
Farm Shop				
Grinder	70	1540	30	46,200
Drill	50	1100	15	16,500
Welder	10	220	30	6,600
Saw	10	220	12	2,640
Air Comp	50	1100	40	44,000
Charger	25	550	25	13,750
Miscellaneous				
Lighting	100	2200	120	264,000
Water System	75	1650	300	495,000
Feed Grinding	20	440	500	220,000
Elevators	25	550	10	5,500
Corn Sheller	25	550	50	27,500
Pig Brooders	50	1100	70	77,000
Barn Ventilation	20	440	500	220,000
Barn Cleaners	25	550	360	198,000
Silo Unloader	25	550	150	82,500
Total for Production				7,865,440
Household				
Lighting	100	2200	240	528,000
Radio	100	2200	80	176,000
Small Appliances	100	2200	60	132,000
Iron	100	2200	60	132,000
Refrigerator	75	1650	420	693,000
Washer	75	1650	30	49,500
Range	25	550	1500	825,000
Ironer	20	440	130	57,200
Dryer	10	220	600	132,000
Furnace	60	1320	200	264,000
Water Heater	25	550	3000	1,650,000
Total for House				4,638,700

1955 County Total Kwhr—12,504,140 Predicted Avg. per Farm—5,680

As a result of this study, we have reached the conclusion that in 7 years the average consumption of the farmers in this county will reach 5,680 kwhr a year. In 10 years the average use will be considerably higher. This table has been presented to show one method of estimating loads 5 to 10 years ahead.

If we are to get rural distribution systems that will render satisfactory service, it is important for the sales or new business department and the engineers to get together. First, to agree

on what the probable loads will be, for after that has been done, nearly every engineer knows what must be done to meet the situation.

Research Work

Whenever a new form of power is brought to an industry, it works revolutions in that industry. I call your attention to what the steam engine did to the sailing vessels and the stage coaches, what the gasoline engine did to the buggy and the wagon. Wherever electric power has gone into a factory, the factory was radically changed, and methods of doing business were radically changed. Whenever any new form of power has been brought to an industry, it has brought about many extensive changes. Electric service is a new form of power brought to the farming industry, and it, likewise, will make radical changes in the equipment used by the farmer, in the method of carrying on farm operations, and will, to a large extent, revolutionize the old methods of farming. If these changes are permitted to work themselves out, many mistakes will be made and much money will be wasted. It is, therefore, highly desirable that efforts be made to do research work to try and determine, as rapidly as possible, the best and most efficient way to apply electric service to farm operations.

The electric light and power companies have been active in such research work since 1923. The principal method of carrying on the work is to join with the experts at the various state universities and experiment stations and with manufacturers of equipment and jointly attack the problems that seem to need research work. The following is a partial list of this type of research work which was begun during the 1920's:

1. Electric poultry brooder—Oregon, California, New Hampshire, and Pennsylvania
2. Electric soil heating—Missouri, Idaho, Tennessee, California, New York, Oregon, and Minnesota
3. Poultry water warmer—Oregon and Indiana
4. Dairy water heater — Indiana, California, and Pennsylvania
5. Stock tank heaters—Washington, Indiana, and Nebraska
6. Electric pig brooders—California, Oregon, and Indiana
7. Tank type milk coolers—Pennsylvania and Indiana
8. Electric arc welders—Washington, Idaho, and Iowa
9. Electric fences — Wisconsin, Oregon, and New York
10. Ensilage cutter—Wisconsin
11. Grain elevator—Michigan
12. Feed grinder—Kansas, Wisconsin, Ohio and Indiana
13. Irrigation pump—California
14. Lamb brooder—Washington and Idaho

The following is a partial list of similar research work now going on:

1. Barn cleaners—Michigan, Wisconsin, Iowa, and West Virginia
2. Universal farm drying units—Virginia, North Carolina, Texas, New York, Wisconsin, and Maryland
3. Silo unloaders—Wisconsin
4. Use of electricity in tobacco production and curing — Kentucky, North Carolina, and Georgia
5. Bee hive heaters—Indiana and the USDA cooperating
6. Individual farm milk pasteurizers—Connecticut and Illinois
7. General purpose farm refrigerators — Washington, Nebraska, Virginia, and Oregon
8. Mechanical ventilation of poultry houses—Oregon, North Dakota, Connecticut, and New York
9. Cooling of poultry houses—New Mexico
10. Egg cooling on the farm—California, Texas, and Maryland
11. Poultry house vacuum cleaners —California
12. Barn cooling and ventilating—New York and Wisconsin
13. New methods of irrigation—South Carolina, Washington, Nebraska, Montana, and California
14. Radio frequency to control bacteria—California
15. Radio frequency for egg grading—New York
16. Study of the effect of ultra-sonic vibration on seed germination, insect extermination, sterilization of eggs and milk—USDA at Beltsville, Maryland
17. Radio frequency for blanching —New York and the USDA Regional Laboratory at Albany, California

In 1938, the United States Department of Agriculture organized a farm electrification research department, which is now assisting materially in promoting this research work.

Electrical Manufacturers' Research

The Westinghouse, General Electric, and other manufacturing companies have research projects on farm electrification under way. The more of this work that can be done, the more rapidly electric service will be fitted into the farm operations to the great advantage of everyone concerned.

The Wisconsin Utilities Association has acquired a farm near Madison, Wisconsin, and has turned this farm over to the University of Wisconsin for the purpose of making research studies. This particular project is to deal with the problems of doing chores on Wisconsin dairy farms. The Wisconsin farmer spends more than half of his working time each year doing chores. Great advances have been made in improving the efficiency of doing work in the field, through the introduction and development of the tractor and the various machines operated by it. A farmer can now do several times as much field work in a day as he could 25 years ago. Similar progress has not been made in improving the efficiency of doing chores, and much of this work that can be done by mechanical power is still done by muscle power.

In Wisconsin, the size of the dairy farm and the number of cows the farmer can handle are determined largely by the amount of chores he can do. It has become the bottleneck of the farm, and, therefore, it is vitally important that studies be made to improve the efficiency of doing chores if the prosperity of the Wisconsin dairy farmer is to be increased. It is hoped that through these research studies the time of doing chores can be reduced 50 per cent. Some progress has already been made in that direction. If this can be accomplished, then the average Wisconsin dairy farmer can operate a bigger farm, handle more cows, and, in general, carry on a bigger business than he now does. This will undoubtedly result in more net earnings to the farmer at the end of the year and at the same time reduce the unit cost of farm products.

This particular research project has been described in some detail, to show what we are talking about.

In other sections of the country, entirely different problems are being

attacked, but in each case, the problems that are most vital to that section will probably be handled first.

For the most part, utility companies are anxious to help support these research projects, and in many sections of the country many are doing so now.

The uses of electricity on the farm are many and varied. It is impossible to foresee now all uses to which electricity will be applied. However, there is a new method of heating now being studied. I refer to the heat pump.

The heat pump is ideally adaptable to farm use, especially in heating and cooling broiler houses, hen houses, livestock barns, and farm homes. In the South and Southwest, poultrymen believe that the heat pump will be the answer to the hazard they encounter every summer in the effect of heat on laying hens. They also think that the heat pump can eliminate the use of hover type brooders. Conditions on a farm, unlike those of urban dwellers, are more favorable for the installation of the heat pump in that there is plenty of ground space and usually a good water supply as sources of heat.

A review of the scattered data which is now available seems to indicate that the heat pump will require compressor motors of between 3 hp and 10 hp and will consume in a well-insulated six-room house between 4,000 and 15,000 kwhr a calendar year, depending on climatic conditions. Typical figures based on present-day efficiencies might possibly be 5-hp compressor motor and 11,000 kwhr of which 9,000 is heating and 2,000 is cooling.

At the present time the majority of residential heat pumps are installed in the more moderate climates and use a 3-hp compressor motor. In addition, each unit may have a fan motor, pump motors or other miscellaneous equipment requiring an additional equivalent of 1½ hp.

Company Organization to Develop Rural Electrification

After the research work is done, and new and improved methods have been found, tested, and tried, then there is still another job to do if the most is to be secured from rural electrification. These new methods must be fitted into the individual farm operation. This calls for organization on the part of the power and light companies, so that they have men who can work with the farm customer and help him to select the proper equipment to install on his farm in order to get the best results. Most power and light companies today either have or are now equipping themselves with such personnel. These men work entirely with farm customers, study their problems, and help them make the best and most efficient use of electric service. Rural electric service is not really what the name implies until you have electricity at work on the farm.

It is not an easy matter to electrify a farm in the best way. It is to the interest of the farmer that it be electrified in the best way, and it is also to the interest of the power and light company that serves him. Hence, these specialists that power companies are employing in ever-increasing numbers. Seventy-two per cent of the companies in the West, 78 per cent in the Northeast, and 50 per cent of the companies in the Middle West have separate farm sales groups. Seventy-six per cent of the companies throughout the nation have specialists, usually called farm advisors, that are not a part of the sales organization of these companies. These farm advisors and farm sales groups have special training, so that they are familiar with the farmer's problems and can intelligently help him to buy and install the proper kind of equipment and carry on farm operations according to the best methods.

Farm Electrification Manual

For the benefit of men engaged in this work, and to summarize the best practices as they are now understood, the Edison Electric Institute has planned and is preparing a manual on the major farm uses of electricity. As outlined, it will consist of 14 sections, twelve of which are already available. They deal with the rural representative's job, history of farm electrification, farm lighting, mow curing of hay, farmstead wiring, farm power, and a directory of manufacturers of farm electrical equipment. The latter, comprising some 600 or 700 names, should be of interest to manufacturers of electrical components.

The section on farm power deals with the selection of the electric motor for operating various farm equipment. Seven other sections deal with farm equipment which covers farm freezing, the farm shop, electric welding, electric brooding, water systems, feed processing, and milking machines. In all the sections there are many illustrations and diagrams of wiring arrangements. Complete with the fourteen sections and the binder, the manual is available from the Edison Electric Institute, 420 Lexington Avenue, New York 17, New York, at $5 per copy for E.E.I. members and at $8 for non-members. I recommend it to you.

To anyone interested in rural electrification, I recommend Mr. Heinton's excellent article entitled, "The Electrified Farm," in the October, 1947, issue of Electrical Manufacturing Magazine.

As the research work is speeded up, and as companies employ more and more specialists to help get the new, improved, and tested methods in operation on the farms of this country, we will then be building rural electrification on a sound basis.

Restofski Appointed Commercial Division Chairman for E.E.I.

HARRY RESTOFSKI, sales promotion manager of the West Penn Power Company, Pittsburgh, Pa., has been appointed Chairman of the Commercial Division General Committee of the Edison Electric Institute, it has been announced by Ernest R. Acker, Institute President. Mr. Restofski succeeds Ralph P. Wagner, commercial manager of the New York Power & Light Corporation, Albany, N. Y., who has been Commercial Division Chairman since 1946.

In his new post, Mr. Restofski will direct the activities of 19 E.E.I. commercial committees, operating in the residential, commercial, industrial and rural fields and covering all types of electrical appliances and uses. His responsibilities will include the supervision of the national promotional activities sponsored by the Institute, such as the Planned Lighting Program, and E.E.I.'s new campaign on all-electric kitchens. He will serve a two-year term in this office.

The Engineer and Internationalism*

Power Industry in This Country an Example of His Effective Method of Approach

By E. G. Bailey
President, The American Society of Mechanical Engineers

An address delivered at the 1948 Spring Meeting of The American Society of Mechanical Engineers, New Orleans, La., March 1-4, 1948

MANY people in the world today are in dire need of things which seem to be out of reach. It might be well to remember that at one time in the history of mankind practically everything now known as a part of our recent civilization, not only was out of reach but no one knew just how to get it. We pride ourselves in thinking that with accurately recorded history, nothing can be lost or even forgotten. Of technical knowledge that is undoubtedly true, but how about the spirit of man? Will this technical knowledge suffice if men do not have the spirit to work together to provide society with the things it needs but are seemingly out of reach?

Power in the Machine Age

We praise highly the spirit of man in rising above his environment in learning many laws of nature and mobilizing natural resources to his benefit. So goes history from the Stone Age, and with the aid of fire, through the Bronze Age, to the Iron Age. As man entered the Machine Age, he actively advanced the development of power. The discovery of electricity and the development of the internal-combustion engine have made power so extensively available that the entire Machine Age has been revitalized. This new development of energy, including both heat and power, has made possible extensive transportation and communications facilities and, in fact, has resulted in a new age of iron, steel, aluminum, and numerous metals and alloys. Even the industries of mining and agriculture have been mechanized to a high degree resulting in great relief from human drudgery.

The availability and use of power has done more to advance the living standards of mankind than has any other single accomplishment of the engineer. Yet developments in power have lagged in some parts of the world and are almost unknown in others.

Why has the power industry made greater progress in the United States than in many other nations? The technical knowledge has been available to engineers everywhere. Is there something in the approach of the engineer in the power industry in this country toward his problems that is responsible for his success? Can this method of approach be applied to other fields and in other nations? May not the engineer's methods of individual initiative and cooperative effort working effectively toward a common and worth-while goal, be a vital force that is needed in many parts of the world if the best use is to be made of the material aid we hope to give them? Is not the application of this method of approach to problems one of the great contributions the engineer can make to internationalism?

Power Industry Typifies Engineering Methods

To enumerate only the principal fields in which engineering has helped and can continue to help mankind is a very long story, but the effective method the engineer has applied can be illustrated by reviewing briefly the history of our use of fuels and the development of our system of electric power generation. This history not only typifies engineering methods in general, but may possibly awaken in other parts of the world the spirit of accomplishment in a field so vital to the welfare of man, i.e., heat and power.

The generation and distribution of power from fuel involves a close cooperation of many branches of engineering and industry. How well each does its part, individually and collectively, materially affects the basic foundation of our modern civilization —the abundance of power at low cost. Secondary factors are the conservation of natural resources and commerce resulting from exchange of fuel and commodities between nations.

The production and utilization of fuel, such as coal, as a generic illustration, starts with geology, mining, and production and includes preparation and sizing, transportation, handling, and distribution, and then combustion—whether it be in the home, central station, locomotive, or steamship. The power process starts a new series of events, beginning with fuel-burning equipment, and following with the furnace and its burners, stoker, or pulverizers, boiler and steam piping, steam turbine, and electric generator. The distribution of electricity involves another chain of events which has been fairly well standardized.

The professions involved in this series of events include the geologist, metallurgist, and the mining, mechanical, chemical, and electrical engineers. Back of each of these are the equipment manufacturers with their engineers to invent, develop, and adapt the necessary mechanisms for mining coal and building power plants, locomotives, or ships. Finally and foremost, there is the broader composite talent known as the consulting engineer, who designs the power system and selects equipment for its operation.

Science, Engineering, and Industry

Modern industry throughout the world is largely the result of the efforts of the scientist, engineer, and industrialist, cooperating to produce economically that for which there is a demand or market.

The scientist and engineer discover and apply the laws of nature to our natural resources by developing meth-

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ods and means for the industrialist to produce power, material things, and services for more people with less labor. Not everyone, today, clearly comprehends the difference between "science" and "engineering." Perhaps this can be clarified by quoting Jevons: "A science teaches us to know, and an art to do, and all the more perfect sciences lead to the creation of corresponding arts. Astronomy is the foundation of the art of navigation. . . ."

James Watt analyzed the essential elements of the principles involved in the early steam engine, made certain deductions, and then, having practical ability and a desire to cooperate with others, proceeded to improve its design and build something which would work with greater efficiency. He did not worry as to whether he was a scientist, an artisan, or an engineer. In fact, he was all of these, as are many men today. Some choose to specialize and be labeled scientists some engineers, and some industrialists.

So long as we maintain our free enterprise system and the pride of achievement, we may continue this advancement of the general welfare of mankind through the use of the creative ability of our scientists, engineers, and industrialists, and our available resources. The laws upon which we depend are universal, and even the psychological factor of getting the most out of them is capable of analysis and utilization toward the benefit of all who wholeheartedly cooperate.

The Electric Power Industry

Since the many conveniences available to all individuals in every walk of life are so dependent upon the use of electricity, we shall pass from the time of Watt, Stevenson, and Fulton, to the turn of the present century, when electric power was an infant industry of less than twenty years of age. At first the greatest demand for electric power came from street railways for urban and suburban transportation. Electric power consumption in the home and factory was very meager before about 1910.

Following closely on Thomas Edison's development of the electric light and other contributions involving the commercialization of electricity, the first power plants used the boiler and engine designed for the textile mill, but with the engine belted to an electric generator instead of a line shaft. Within a few years the belt drive was eliminated, and specially designed generators were directly connected to relatively slow-speed Corliss engines. The steam pressure gage, water column, and steam-engine indicator were the principal instruments for checking the performance. The over-all thermal efficiency of such plants was relatively low, about eight per cent, so that three or more pounds of coal were required per kilowatthour.

The largest and most efficient of the earliest plants were built for the Interborough Rapid Transit Company, New York, N. Y., under the general guidance of the late Mr. H. G. Stott, an active member of this Society. These stations are still operating, some of them using the original equipment, but they have been enlarged by adding more modern equipment as the years passed and expansion was required.

The important contributions of Sir Charles Parsons and Charles Gordon Curtis in developing the steam turbine permitted larger power units and higher efficiency through the possible use of higher steam pressures and temperatures.

The diversity of the problems previously mentioned demanded a wide variety of talent, ability, and experience of the men coming from marine and stationary power fields, as well as the graduates from the engineering schools. It also required, above all, cooperation of a high order. This cooperation extended not only between the men responsible for the design and operation of a single plant and electric system, but very quickly those engineers, who, having had experience in the design of one plant, formed consulting engineering firms to design plants for others, so that valuable experience was generously contributed to all. Information was exchanged through publications and discussions of technical papers in the technical press and the transactions of the national engineering societies, which were then functioning and growing rapidly.

Influence of the Prime Movers Committee

Phenomenal growth of a basic industry—power generation—involving so many new engineering problems, was accomplished through real ability and stamina of a high order, together with the knack of coordinating the efforts of many associates and suppliers of suitably designed equipment.

One of the principal reasons why the power industry is where it is today, and is still actively expanding, is that in 1911 the progressive operators of some of the larger plants formed the Prime Movers Committee. This committee is composed of representatives from the major operating companies. It holds two-day meetings four or five times a year. The members discuss frankly and freely the troubles and good points of their equipment. They sift out a true and fair diagnosis of operating problems and of performance of equipment. Oftentimes, if needed, corrections can be made on equipment already installed. Practically all operating data are available to the consulting engineers and to companies building new plants, and through them to manufacturers of equipment, so that everyone is on his mettle to acquire the most up-to-date knowledge and to apply it to new units, which follow in relatively rapid succession.

This procedure has already resulted in increased steam pressures and temperatures, improved efficiency, larger units, greater reliability, and wider adaptation of different fuels, especially low-grade coal, and oil or gas where geography and economics permitted.

Stationary Plants in Europe

The Prime Movers Committee exists today, and as a result of their activity the new central stations being built use still larger and more efficient equipment. For instance, a single unit comprising one boiler which generates 1,000,000 pounds of steam per hour at a pressure of 2000 psi and temperature of 1050 F and reheat is current practice. One turbogenerator produces 125,000 kw. Expected thermal efficiencies of 36 per cent are more than four times those of the earlier stations and exceed the probable efficiencies of the Diesel engine or the gas turbine using high-grade oil. These large and efficient steam-generating units use relatively low grades of coal which could not have been satisfactorily burned on the hand-fired or primitive stokers of 30 years ago. Now let us look at the progress of the power industry in Europe.

A complete detailed comparison of European stationary power plants

with those in the United States would require more time to present than is now available. A few high spots of conditions in Germany, France, and England will indicate the diversity of practice which has been followed by engineers, all of whom were entirely familiar with the experiments, developments, and practices in the United States and all other countries, including Russia, prior to about 1938.

Throughout all of western Europe pulverized coal was adopted in a number of plants shortly following the rapid progress made in the United States from about 1916 to 1923. By 1928 Germany had equipped several of its larger boiler plants with pulverized coal, using the bin system of the Cahokia-1922 design. However, German engineers diversified widely on some details of auxiliary equipment, and particularly pulverizers, the principal divergence showing the characteristic German method of trying or prejudging all kinds of pulverizers and then developing new ones, including the steam jet, the grindless mill, and still others prone to failure because a complete study of the fundamental problem had not been carefully made.

By 1936 they had swung back to stokers of both the chaingrate and underfeed type in several new installations. During this time the use of stokers in the United States was largely discontinued, except in smaller plants where the spreader stoker has more recently been steadily gaining in favor. Practically no stokers of the spreader type were developed in Germany.

European Design Practice

The Germans have advanced ahead of the rest of the world beginning in the 90's with the design of efficient by-product coke ovens, production of gas from coal, and problems involving economical processing of coal. However, their interest in the simpler problem of burning coal for the generation of heat and the production of steam was evidently not sufficient to inspire them to properly evaluate what was being done elsewhere regarding the best methods for generating power. Their interests seemed to go rather to trick boilers with forced circulation, such as the Benson, originating in England, or the forced-circulation boiler with return flow, known as the La Mont, originating in the United States, or the Loeffler, originating in Austria and developed commercially in Czechoslovakia.

The Germans never seemed to analyze the engineering, physical, and thermal problems with any accuracy in the original design, nor to work their way out of problems by empirical or cut-and-try methods. There seemed to be a lack of cooperation between the professor-engineer responsible for a design and the operators of the equipment. There was no equivalent to the Prime Movers Committee for cooperating in the sifting out of facts.

In France, Holland, and Belgium power development followed more closely a combination of the United States and British practice, rather than that of Germany.

In England, as in Germany, we find individualism of a high order, but there engineers followed partly the United States trend to pulverize coal, and then went back to underfeed stokers, but always keeping the chaingrate stoker on a larger percentage of the medium-sized plants than might have been best. They did not actively develop the spreader stoker, which was conceived there fifty years earlier.

In London and most urban centers England rightfully paid much attention to fly-ash and grit discharge from stacks. Two seldom realized factors differing from conditions in the United States are the lower average wind velocity and the higher average humidity, which, when combined with smoke and dust particles, result in most difficult fogs militating greatly against the use of pulverized coal without the introduction of expensive dust-cleaning and gas-washing equipment. Some British plants installed forced-circulation boilers of the Leoffler, La Mont, and modified Benson types.

Developments in Power Plants

In the United States, as in the rest of the world, the first divergence in power equipment came between the fire-tube boiler and the water-tube boiler. Designs of both were developed very early in the history of steam throughout the world, but the problem was quickly analyzed and solved, with almost unanimous leaning toward the water-tube boiler for the higher pressures which were made possible with it.

The next important innovation was the steam turbine, which replaced the steam engine. That transition was made quickly and almost completely, except for locomotives, with very little controversy throughout the world.

A major step in power-plant design came when pulverized-coal firing superseded stoker firing in the larger units. Although confined to larger boiler plants, the battle between stoker and pulverized-coal firing raged quite fiercely through the 20's in the United States. Looking back at it now it was the old story of some taking the high road and some taking the low road, both following through until the advantages of the one over the other were proved to the satisfaction of all interested engineers.

The present active subject of further transition and progress relates to steam pressures and temperatures. While the answer will be reached logically from unbiased data and experience, the same answer will not apply economically to all conditions as to size, use, load factor, and fuel cost.

In the isolated industrial plant, such as in the chemical industry, where a process calls for a higher proportion of kilowatts than of steam in the form of Btu, engineers appreciated the advantages of higher steam pressures earlier than they did in the central-station industry. The Germans first perceived this. The British saw value in higher steam temperatures earlier than did the engineers in the United States.

U. S. Builds Larger Power Plants

In the United States the power plants are larger because the engineers appreciated the relationship between size of equipment and cost per unit of output, which was an important factor in the rapid growth in the use of electric power.

The steam locomotives of fifty years ago were in keeping with stationary and marine power plants of that day. As a matter of fact, they operated at about 100 psi higher steam pressure and produced more power per boiler than did other individual boiler units before about 1900.

Throughout the United States, England, and Europe, considerable effort has been made to improve the power and efficiency of the locomotive by the

use of superheated steam, better valve gear, improved drafting in front end, fire-box arch, and mechanical stokers. Other more radical developments have been tried from time to time in different countries, such as the burning of pulverized coal in the conventional fire box, special high-pressure boilers, compounding of engines, and steam-turbine drive, without significant success.

Work is still being done, but in a rather discouraged, half-hearted way in so far as the steam locomotive is concerned. It is believed that the United States and many other countries having a basic coal economy should work more diligently on this problem. Possibly, the Prime Movers Committee method could be made to work better for the railroads than have some other efforts tried up to date.

Developments in Marine Power Plant in the United States

It was the early practice of shipyards to equip the ships built for both the merchant marine and the Navy with their own power-generating equipment, usually consisting of Scotch marine boilers and reciprocating steam engines. Later, water-tube boilers were introduced, primarily in the Navy, and, finally steam turbines. Practically all of this equipment was built in the shipyards.

The progress in the merchant marine was not as rapid as that of the Navy because the various operating companies did not have the equivalent of the Prime Movers Committee to exchange information as to the performance of the equipment which they purchased from manufacturers, according to the naval architects' or shipyard specifications.

The outstanding contribution in the marine field is that of the United States Navy. In fact, the Navy really led the progress in steam engineering for many years. Pressures of 300 psi and also turbine installations were standard practice in United States naval ships for some years before similar steam pressures and equipment were in general use in stationary practice. However, due partly to almost unlimited space and weight allowance, as contrasted with the rigid requirements of naval ships, stationary practice gradually passed and later far exceeded Navy practice in the use of high-pressure and high-temperature steam and the machinery for its efficient utilization.

In 1892 the Navy, realizing the need for saving weight and improving the efficiency of fuel consumption, established a system for collection and comparison of operating performance, including efficiency, reliability, maintenance, and repairs.

During the first world war the Navy turned generally from coal to oil, based primarily upon the performance of a few vessels equipped with oil burners in 1912. Before converting to oil, the Navy conducted a series of very careful tests to develop suitable oil-burning equipment and to establish new methods of operation. Training schools were then initiated.

In the early 30's further advanced steps were taken to increase steam pressures and temperatures and to improve the design of all of the main propulsion equipment and auxiliaries of Navy ships in order to obtain the maximum possible efficiency.

As the equipment for higher pressure and higher temperature was studied, the manufacturers used the experience gained with the central-station group and applied it to the rigid requirements of minimum space and weight and other specifications of the Navy. Furthermore, all new or modified designs of boilers were subjected to complete performance tests up to full power and overload. These thorough studies and tests made it practically impossible for any equipment to be installed that was not designed and built to perform as expected. The beneficial results from such a program have been so thoroughly demonstrated by the experience in the last war that there can be no doubt that this method is largely responsible for the steam plants which performed in a satisfactory manner often operating over 250,000 miles without an outage or opportunity for maintenance, and without any deleterious effect on performance.

German Navy

During the last war many ships of similar classes from the British and United States Navies had parallel tours of duty and fueled at the same stations. The oil consumption was noticeably lower on the United States ships, because of the use of the higher steam pressure and temperature, as well as other details of design relating to performance of auxiliaries, steam piping, and the like.

An unusual amount of information is now available through British Intelligence Objectives Sub-Committee[1] regarding the operation of the steam plants of the German Navy during the last war. Even to those who, prior to the war, had acquaintance with the German steam-engineering practice in stationary plants and the merchant-marine field, it was a surprise to learn that the steam-boiler-plant operation in the German Navy was so poor.

German Boiler Tube Troubles

Quotations from this report follow:

The new vessels of the German Battle Fleet have since the year 1934 been equipped with high-pressure superheater steam plants, which involved a considerable increase in steam pressures and temperatures over the wet-steam installations formerly used on German war vessels (270 psi to 1000 or 1800 psi, and from wet steam to superheated steam of 840 F).

To ascertain the most suitable types of boiler, three boiler systems were tested: Benson boilers, La Mont boilers, and Wagner boilers.

The first working tests were carried out with the escort vessels F.1 to F.12, the first half of which had La Mont boilers and the other Benson boilers. Before, however, the tests of these vessels were quite concluded, new vessels were put on order, namely, the destroyers 34 with Wagner and Benson boilers, and the torpedo boats 35 and Minesweepers (M Boats) 35 with Wagner boilers. These were followed by the battleships *Scharnhorst* and *Gneisenau,* both with Wagner boilers, and the cruisers *Blucher, Hipper* and *Prinz Eugen,* with La Mont boilers. Only with the later vessels could the working tests made in the meantime be taken into account.

All high-pressure superheated-steam vessels in service, especially the destroyers and torpedo boats 35, suffered from so many boiler and superheater tube troubles that scarcely one trip was accomplished without a boiler falling out—and this was invariably accompanied by a grievous loss of speed. . . . The most serious situation was in the case of the Wagner (natural-circulation) boilers, where the tube damage had the effect of causing a splitting open of the boiler tubes (later referred to briefly as "tube ruptures") and in every case led to the immediate stoppage of the boiler.

Superheater-tube damage followed later in increasing degree, involving very frequent, though shorter, interruptions in service.

The statements of the different commands regarding the causes of the boiler damage were very contradictory. In most cases they were attributed to material defects. A mi-

[1] The Activities of the Commission for Boiler Protection and Feed Water Treatment (KKS) for the Chief Commanding Officer of the Admiralty. H. M. Stationery Office, London, England.

nute inspection of the tube damage and systematic investigation of the causes was therefore indispensable.

The damage and corrosion occurring in the Benson (once-through forced-circulation boiler without drum), and the La Mont (forced-circulation boiler with separating drum and return flow), were fundamentally of a similar nature to the damage in Wagner (natural-circulation) boilers.

The urgency of this situation called for the best talent available to take hold with power to act. According to the report, the engineers delegated with this authority were able to determine very quickly that the major trouble was not due to defective tubes but rather to inadequate feedwater treatment, a chemical function recognized throughout the world as a necessity in even medium-pressure boilers. They did not deaerate the feedwater, and the oxygen, normally always in solution in water, attacked and corroded the tubes at the pressures and temperatures used.

Tube Failure Data

Further, in an overzealous effort to save weight the margin of safety had been reduced by the designers, resulting in localized high rates of heat absorption and reduced water circulation below safe limits on all types of boilers.

The record of improvements accomplished in the belated struggle to overcome their difficulties is interesting in comparing the failures on eight destroyers of the same class, four having Wagner boilers and four having Benson boilers.

NUMBER OF FAILURES

Destroyers	Boiler	Circulation	Year 40/41	Year 41/42	Year 42/43	Total failures
Z.4, Z.5, Z.6, Z.20	Wagner	Natural	62	23	6	91
Z.10, Z.14, Z.15, Z.16	Benson	Forced	89	95	52	236

From these data, it is noted that the failures of the Benson boilers were 44 per cent greater than the failures of the Wagner boilers during the first year's record. In three years, the rate of failure had been reduced 90 per cent on the Wagner boilers, but only 40 per cent on the Benson. The total record of 91 failures on the Wagner and 236 on the Benson boilers may be a great surprise to many people in this country who have been emulating or recommending to us the methods of the German scientists and engineers.

In addition to the boiler design itself, fuel was burned very poorly, partly because of inadequate burner designs. The Germans had ready access to all of the types of oil burners being used elsewhere, but used their own Saacke rotary-cup burner, which they presumed to be superior to the almost universally used pressure-atomizing burner.

The quality of fuel oil available was constantly deteriorating, and from the Ebano oil orginally available they used mixtures of tar-oil derivatives, gas oil, and Esthonian shale oil, all of which contributed to poor combustion.

International Cooperation

In short, practically everything involved in the modern design and operation of boilers was found to be wrong in actual practice in the German Navy.

Parts of this paper may not seem to be closely related to the title and the presentation may seem to be somewhat indirect, but it represents an engineer's approach to a problem involving some aspects of international psychology by stating facts and making pertinent comparisons.

Engineering is recognized as an exact science, but it is only after the laws of nature have been explored with sufficient thoroughness and open-mindedness that all engineers can agree upon the final conclusions as being factual.

When history shows that in the field of power generation, with the same kind of fuel being used to make the same kind of power, some, following certain methods, achieve much in efficiency and reliability, while others, following different methods, achieve neither efficiency nor reliability, there must be some explanation.

There is a human trait that shows up in all walks of life, viz., the pride of authorship. This is commendable to a degree, but when engineers are entrusted with the natural resources of our country or of our world, and have the responsibility of using them for the preservation and betterment of mankind, such opportunities and responsibilities must be taken seriously, and not interfered with by personal traits, likes, or dislikes.

Another human trait frequently evident is that when one surpasses others in almost any accomplishment we are all too often inclined to alibi by attributing the success to better opportunities or more fortunate conditions. It is true that "time and chance" often play a part but under most circumstances the prize goes to the strong and justice finally prevails.

The Prime Movers Committee of the electric power industry is an excellent example of how a system of checks and balances has submerged the individual pride of authorship and success to the benefit of all, not by stifling it, but by encouraging it toward active competition with others. The rewards are engineering accomplishments, which enable each engineer or group of engineers to "see themselves as others see them."

Teamwork Plus Competition

The purpose of this discussion is to encourage serious study of a comparison of the natural resources, economic conditions, and educational methods—in schools, industries, and professional societies—in the United States and elsewhere, so that engineers everywhere will be familiar with, and be in a position to use, constructive ideas that have already been tried and proved by experience.

This brief outline of the development of the industries generating heat and power is illustrative of the engineering methods which have been fruitful in bringing about their present status. From this we may draw two main conclusions:

1. Power development may in like manner be extended more rapidly and economically in other fields and countries by following similar methods.

2. Similar methods have already proved sound in developing other industries and may be properly applied still further in the same industries and also into new fields of endeavor.

In order that there may be no misunderstanding about the method described in comparison with some of the present means which may seem to be the same, the method by which the power industry was developed in the United States was that of individual initiative and cooperative effort working effectively together toward a common and worth-while goal; the spirit of both teamwork and competition being continually rekindled through our

(*Continued on page* 260)

The Prime Movers Committee

(An editorial reprinted from **Mechanical Engineering** *for May, 1948)*

IN view of the high praise which E. G. Bailey bestowed on the Prime Movers Committee in the address he delivered at the 1948 ASME Spring Meeting in New Orleans, published in this issue, further comment on the Committee may be of interest.

In the presidential address to the National Electric Light Association in 1903, Louis A. Ferguson said, "We should appoint a committee of three good mechanical engineers to follow the development of the steam turbine during the coming year and report the results at the next convention."

The committee appointed, known as the Committee for the Investigation of the Steam Turbine, was made up of Wm. C. L. Eglin, chairman, Fred Sargent, and A. C. Dunham. Its 1904 report reviewed the history of and described current developments in that prime mover. In 1905 the committee was enlarged to five members, among whom was Irving E. Moultrop. The 1906 report contained a supplementary section on European developments based on material gathered by Mr. Moultrop during a trip abroad. Its task completed, the steam-turbine committee asked to be discharged. In its place there was appointed, also under the chairmanship of Mr. Eglin, a Committee on Gas Engines. Mr. Moultrop and J. B. Klumpp were members of this committee and a report was presented in 1908. Mr. Klumpp succeeded to the chairmanship in 1909 and Mr. Moultrop in 1910.

Prime Movers Committee Organized

The value of the work of these two committees suggested the desirability of organizing a standing committee of broader scope and larger membership; and in 1911, in the first report of the Prime Movers Committee, as it was called, Mr. Moultrop wrote: "The Prime Movers Committee, unlike its predecessors, the Steam Turbine Committee and the Gas Engine Committee, has no newly developed type of apparatus to report on and has, therefore, devoted its attention to standard apparatus in use by the various member companies."

Early reports of the Committee dealt with specific classes of equipment and current developments and practices related to prime movers. They were prepared by a growing number of subcommittees and supplemented by statements provided by manufacturers. Within 20 years the committee had been enlarged to about 70 members and the reports filled hundreds of pages.

"Round Table" Discussions

Discussion of the many reports of the Committee naturally resulted in differences of opinion as the experiences of operating men brought new points of view and practical problems into focus. The Committee thus became a means by which operating experiences could be frankly discussed. Light on one operator's difficulties was shed by others who had faced the same or similar troubles. A "round-table" discussion of such experiences developed and became an important feature of meetings of the committee. Eventually, questions were sent to the chairman of the round table in advance and were distributed by him to all members of the Committee. Discussion of these questions at Committee meetings brought forth useful answers, based on experience and specific in detail. New techniques, new equipment, new methods were reported freely. All gave of their experience and knowledge, all absorbed and benefited by what had been thus freely given. Nor did the process stop there. Manufacturers learned how their equipment was working out in daily operation. Consulting engineers and designers profited also. Ideas and equipment, tested on the proving ground of day-to-day experience and subjected to full frank discussion, had to be good to survive. Progress was rapid and widespread. Nowhere in the world had there been developed before, in so concentrated a field, a system by which any plant or any engineer could benefit so freely and quickly from the knowledge and experience of other plants and other engineers. Nowhere in the world had there ever been such close, such frank, such cooperative relationship between the men who design and the men who operate equipment. The result was, as Mr. Bailey points out, greater and more rapid progress in the power industry in this country than in any other.

When the NELA went out of existence and the Edison Electric Institute began its work in 1933, a Power Generation Committee of only 26 members under the chairmanship of Alex D. Bailey "planned to undertake the work formerly done by the Prime Movers Committee." In March, 1934, Mr. Bailey reported to the Operating Committee of E.E.I. a need for an expansion of the personnel of his committee, and the Power Generation Committee itself discussed "enlargement of the committee to procure a more representative basis." The report of the June 5, 1933, meeting of the Power Generating Committee defined its scope as "a continuous study of the economics of power generation, including the various sources of power now used or in prospect, and the development and operation of mechanical equipment used for power production, including the study of fuels and their utilization in steam-generating equipment or in internal-combustion engines, the utilization of water power, the design, construction, and operation of power stations, the operating characteristics of generating stations, and the interrelation of various costs of generating electrical energy."

Study Group Reports

This main committee was divided into five principal study groups: Hydraulics, Norman R. Gibson, chairman; Steam Generation, Alfred Iddles, chairman; Turbines and Auxiliaries, E. B. Ricketts, chairman; Oil and Gas Power, Louis Elliott, chairman; and Binary Cycles, J. T. Barron, chairman. By 1934 the present Prime Movers Committee had emerged from these five groups and reference to the Power Generation Committee ceased.

In November, 1934, Alfred Iddles, chairman of the Prime Movers Committee, introduced the first report as follows:

"This Committee, under its scope, has oversight of all technical questions relating to power production except hydraulic power. Its concern is there-

fore with a great diversity of equipment in the steam-raising plant, the engines for final application of power to electric generators, and the auxiliaries and appurtenances thereto, as well as fuels, lubricants, and water supply. By reason of the variety and number of equipments and the circumstance that they are assembled into complete power plants no one of which is exactly like another, the accumulation and exchange of actual field experiences has a value that is greater, perhaps, than in any other technical department of the industry. This is reflected in the procedure of the committee where a premium is placed on actual experience that is applicable to similar but not precisely identical situations in other places."

Increased Membership

Over the last dozen years the membership of the Committee has increased from 35 to something over 60. The present chairman, G. C. Daniels, described the work of the Committee as it is conducted today in the following manner:

"The work of the Committee is handled through special subcommittees which are changed from time to time as the need for them becomes apparent and are dropped when the need ceases to exist. These subcommittees in general publish reports, either yearly or at two-year intervals, which have wide distribution and sale. These reports contain a brief statement of the trend and a summary of the report by the subcommittees. This statement is carefully edited and must have unanimous agreement by the Prime Movers Committee members before it is released. The reports usually contain data obtained from questionnaires sent to all members and also individual company statements which have been prepared for the Committee but for which the Committee assumes no responsibility. The manufacturers are also solicited for statements, which, however, are restricted to new equipment or unusual or valuable operating experience with their equipment.

"In addition to the subcommittees, numerous memberships on other national committees, such as those of ASTM, ASA, and ASME, are held by members of the Prime Movers Committee who bring their problems before the Prime Movers Committee and also keep the committee informed of the progress of the work being done by the other associations.

In addition to the work of the subcommittees, the Prime Movers Committee conducts a round table devoted to the discussion of operating problems and unusual experiences. Questions for the round table are solicited several weeks before the meeting and are sent out to the membership in time to allow for the gathering of data for answering specific questions within their experience. During the past year the Committee has also been conducting a round table on design problems."

Dr. A. E. White, of the University of Michigan, who has been associated with the Committee since 1925, and looks upon that association as "one of my most valued contacts," has said:

"The Committee, through its work, has made most valuable contributions in the field of power generation. Free and frank discussions are held with regard to developments and to operating difficulties which have been experienced. These contributions have been of outstanding importance to the companies represented on the Committee. They have made it possible for various companies to forestall difficulties in plant performances and thus reduce costs in plant operation, with a resulting benefit to the public. Furthermore, the improvements which have been made in various plants with the aid of or at the suggestion of the various companies producing power-plant equipment have been reported by the companies concerned and have been adopted in many cases by other companies."

Benefits of Experience

Dean A. A. Potter, of Purdue, who was a member of the Committee from 1920 to 1932 and has attended its meetings as a guest since then, says:

"This Committee is, to my way of thinking, one of the best agencies for bringing out faults in equipment and operating techniques of power plants in existence. Members of the Committee have always been ready to give to the others the benefit of their experience. Since the meetings of the Committee are not open to salesmen or representatives of manufacturers, the discussion is very frank, and has resulted in uncovering some serious matters, the correction of which has benefited industry and the public."

Such testimony ably supports Mr. Bailey's opinion that the Prime Movers Committee has evolved a method of procedure, typically engineering in its objectivity, which has resulted in more rapid advances in the power industry in this country than have been made in others where close cooperation of operators, designers, manufacturers, and consulting engineers has not been developed. As Mr. Bailey points out, the method can profitably be adopted and developed by other industries in this country; and it is not beyond possibility that it or its fruits might be a powerful factor in the rapid and sane reconstruction of a war-devastated world. Such a result might be a contribution of the engineers of this nation to the cause of internationalism, which is Mr. Bailey's thesis. In this connection, Colonel Cary's comments on the current accomplishments of Engineers Joint Council, will be of interest and encouragement. With so fruitful a method and example as the Prime Movers Committee and with so representative an organization as EJC to spearhead the effort, engineers have an opportunity and a means to contribute to peaceful settlement of the world's troubles.

Lighting Program Available For Grade Schools

A PROGRAM through which electric utility companies can assist the elementary school teachers in their areas to bring their students important information on the relationship between light and sight, with helpful instruction on the use of modern lighting fixtures and lamps for more adequate sight protection, has just been released by the Better Light-Better Sight Bureau.

Intended for the instruction of children in the fifth and sixth grades, the program consists of a group of twelve large-size, colored charts, with leaflets, quiz sheets and a teacher's guide. Material for a series of three lessons is provided, to cover first the function of the eye in seeing, then the importance of adequate light for varied seeing tasks, and lastly, the proper use of light to help the eyes. Three leaflets are supplied for distribution to pupils,

(*Continued on page* 259)

Joint AEIC-EEI Heat Pump Committee Survey

Includes 247 Installations in 30 States

THE use of the Heat Pump as a year-round air-conditioning device is still in the embryo stage. Tremendous interest shown by individuals throughout the country makes it necessary for authoritative information to be published periodically. The Joint AEIC-EEI Heat Pump Committee is endeavoring to do this.

A nationwide survey is being conducted at the present time to obtain accurate factual data on each installation known to the Committee. Fig. 2 shows the questionnaire being used in this survey.

This article reports the present status of one phase in the survey which will not be completed until all available operating data is obtained.

A primary use of the questionnaire is to establish definite locations for each installation so that a general picture of the various climatic areas in which the Heat Pump is being used, may be obtained. Data concerning this phase of the survey has been compiled and is shown on the distribution map (Fig. 1).

The distribution map shows the Heat Pump installations throughout the country, known to the Committee, as of June 15, 1948. These are not necessarily "successful" installations, but are all types, and of various operating efficiencies. This map does not include all Heat Pump installations throughout the country; installations are included only when sufficient authoritative data has been received on the questionnaire form.

There are 247 installations, reported as actually operating, consisting of 298 Heat Pump units, shown on the map. Of these, 50 percent are located in the 60F-70F Mean Annual Temperature Zone; 34 percent in the 50F-60F zone; 10 percent in the zone above 70F; and 6 percent in the 40F-50F zone. The installations have been spotted as accurately as possible to correspond to their approximate geographic locations.

The distribution of installations by states is shown in Table I. This tabulation also designates the number of installations as Commercial or Residential.

The question of heat source is of primary importance when discussing Heat Pump installations. Although air was initially the major source, the picture at present shows a trend toward other media. Of the 247 installations concerned in this article, 152 utilize air as a heat source, 76 use water (wells, lakes, or city water), and 19 use earth. Research is being conducted at the present time to determine the comparative efficiencies of these heat sources. An article in the March 1948 EEI BULLETIN reported on this work.

The Committee is also concerned with the correlation of theoretical results from research activities and actual field tests on existing installations.

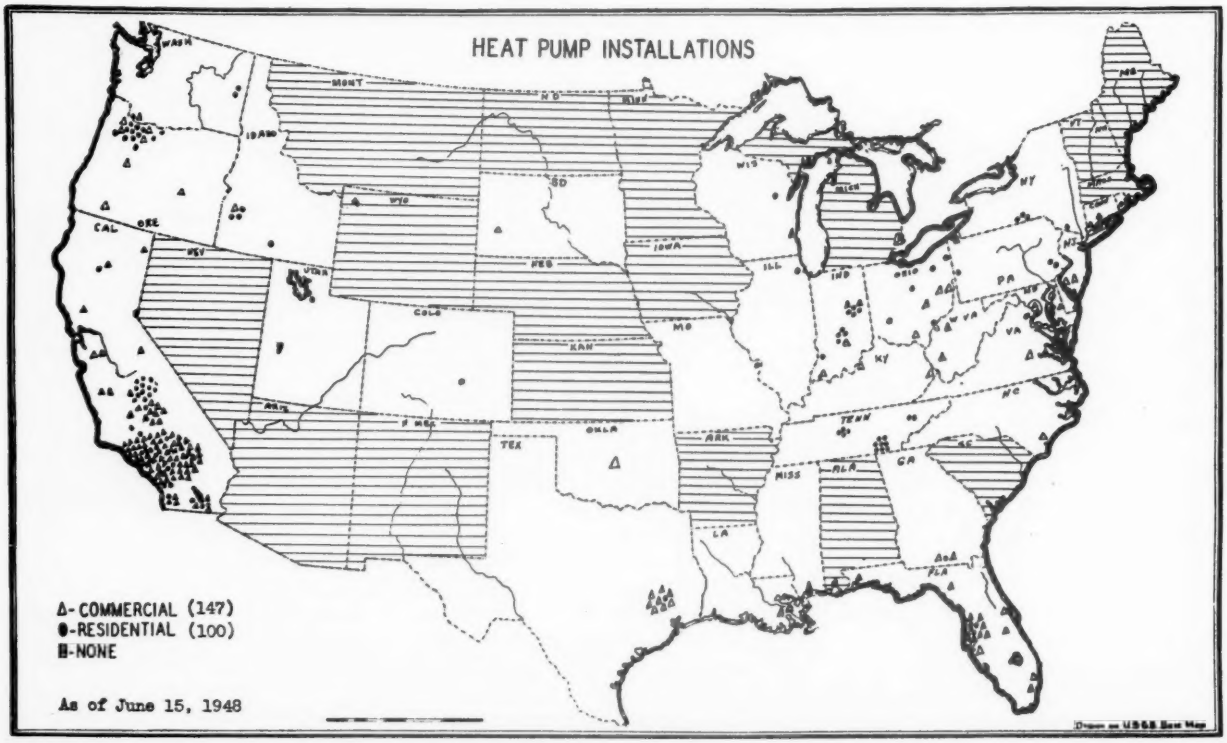

Fig. 1—Map of Commercial and Residential Heat Pump Installations, Showing Their Distribution by States as of June 15, 1948

TABLE I

State distribution of Heat Pump installations
Data as of June 15, 1948

State	*Residential*	*Commercial*	*Total*
California	34	86	120
Colorado	1	0	1
Connecticut	0	2	2
District of Columbia	0	2	2
Florida	4	13	17
Georgia	1	2	3
Idaho	4	1	5
Illinois	1	0	1
Indiana	9	4	13
Kentucky	0	2	2
Louisiana	0	2	2
Maryland	0	1	1
Mississippi	0	1	1
Missouri	1	0	1
New Jersey	0	2	2
New York	4	0	4
North Carolina	0	1	1
Ohio	4	4	8
Oklahoma	0	1	1
Oregon	12	7	19
Pennsylvania	3	1	4
Rhode Island	1	0	1
South Dakota	0	1	1
Tennessee	14	0	14
Texas	1	8	9
Utah	1	0	1
Virginia	1	2	3
Washington	3	1	4
West Virginia	0	2	2
Wisconsin	1	1	2
Total	100	147	247

Date_____
By_____

JOINT AHIC-REI HEAT PUMP COMMITTEE
INSTALLATION AND FIELD TEST DATA ON HEAT PUMP SYSTEMS

1. Location (City)_____ Utility Company_____
2. Owner_____ Bldg Usage_____
3. Equipment Manufacturer_____ Contractor_____
4. Type and Serial Number_____ Date Initial Opera_____
5. Rated Capacity, Btu per Hr: Heating_____ Cooling_____
6. Motor Rating, Hp: Compr____ Fans____ Pumps____ Other____ Total_____
7. Heat Source_____
8. Space Served: Type Structure_____ Vol, Net Cu Ft_____
9. Design Conditions: Heating Cycle, F db, Outdoor_____ Indoor_____
   Cooling Cycle, Outdoor____ F db____ F wb, Indoor____ F db_____ % rh
10. Calculated Load, Btu per hr: Heat Loss_____ Heat Gain_____

Test Data

		Heating	Cooling
	Date.....		
11. Conditioner Coil:	Air quantity, cfm.....		
	Entering temp, F, db - wb	-	-
	Leaving temp, F, db - wb	-	-
12. Ventilation Air:	Quantity, cfm.....	-	-
	Entering temp, F, db - wb	-	-
13. Compressor:	Head pressure, psig - cond temp, F..	-	-
	Suction pressure, psig - suction Temp, F.....	-	-
14. Refrigerant Liquid	Subcooling Coil:		
	Liquid Temp, F, entering - leaving..	-	-
	Gas temp, F, entering - leaving.....	-	-
15. Condenser-Cooler:	Water or air quantity, gpm or cfm...		
	Temperature, F, entering - leaving..	-	-
16. Electric Power Requirement, kw;			
	Compressors.....		
	Fans (describe)_____		
	Pumps.....		
	Other (describe)_____		
17. Capacity Obtained,	Btu per hr: (output)		
	Sensible.....		
	Latent.....		
	Total.....		
18. Coefficient of Performance:			
	Based on Compressor Motor input kw..		
	Based on total input kw.....		

19. Comments:
    a. Operating features_____
    b. Difficulties experienced_____
    c. Suggested improvements_____
    d. Other_____

ERA/WFF
7 Oct 1947

Fig. 2—Questionnaire Used in Nation-Wide Heat Pump Survey

The Test Data section of the questionnaire (Fig. 2) will be employed as a guide for the selection of the most representative, or most suitable, installations that are needed for this purpose.

To facilitate the collection of this test data and provide a uniform basis for comparative analysis, the Committee is developing a standard test procedure. An explanation of this procedure will be published in a future issue of the BULLETIN.

Thirty Thousand Hours A Minute

(*Continued from page* 238)

4. The benefit to the stockholder would be shared by those millions for whom jobs would be created and preserved, and by the nation as a whole.

The shortage of venture capital is today's most critical domestic question. Sound solution of that basic problem will open the door to a productive and profitable future for everybody. If that solution is so clearly marked, surely all of us can unite, not for selfish reasons but in the true national interest. The resulting advantages would be immediate, universal and lasting.

This money problem will be solved, because it has to be. So too, with every problem that may arise as to machines, materials, operating techniques, management methods, or sales expansion. There is no ceiling to American ingenuity, especially in the presence of opportunity and incentive.

A year ago, on this same platform, Elmer Lindseth said to you: "No other industry offers more opportunity. Our possibilities are unlimited." Anything I have said to you is only confirmation of that statement. If I have succeeded at all, it is in helping a little to pile up the evidence that this unlimited future has in it both ample room and urgent demand for the best manpower that you can bring into it, as well as for the leadership that you are raising from the ranks.

If there is a manpower problem in your industry, is not the answer, first, to provide all those forms of recognition and compensation that spell incentive, and next, to bring the thinking of these future leaders up to the higher and broader level which the facts so richly and clearly sustain?

You men are here today because, years ago, you sensed your industry's opportunities and reacted to its incentives. If you can transmit that vision to those who are following you, if you can fire their imaginations with the still greater opportunities that even now are squarely facing you and them, your industry's ultimate horizons will be far beyond those I have tried to define.

From the beginning, the electric power business has been an industry of progress. It is a monument to what can be accomplished by free men and private enterprise operating under our system of government. You can gain ample satisfaction from your past accomplishments. At the same time, you can look with assurance to a future which will far outshine the most glittering of your industry's previous chapters.

PERSONALS

CHARLES E. KOHLHEPP, vice president and general manager of the Wisconsin Public Service Corp., Milwaukee, since 1945, has been elected president of that utility. Mr. Kohlhepp

MR. KOHLHEPP

succeeds J. P. PULLIAM, who has requested that he be relieved of his duties as president. At the same time, vice president C. R. PHENICIE also retired from active service though both he and Mr. Pulliam will continue as members of the board of directors, Mr. Pulliam as chairman of the executive committee and in an advisory capacity. Mr. Kohlhepp has been identified with Wisconsin Public Service in various capacities since 1919.

A native of Baltimore, Mr. Kohlhepp was employed as an accountant at the Baltimore Drydock & Shipbuilding Co., owned by a Milwaukee group which controlled the Wisconsin Securities Co. Through the group, he was brought to Milwaukee in 1919 as an accountant for the utilities companies of the late Clement C. Smith. When the companies merged in 1922 as the Wisconsin Public Service Corp. he was made auditor. He served as vice president and treasurer from 1938 to 1945 when he assumed the general managership.

During World War II, Mr. Kohlhepp served as director of the Program Bureau of the War Production Board for more than a year. He is a former president of the Wisconsin Utilities Association and has been active in committee work for the Edison Electric Institute.

Both Mr. Pulliam and Mr. Phenicie are veterans of many years of WPS service, Mr. Pulliam starting in 1917 and Mr. Phenicie in 1911. Both had held key management positions throughout the formative and developmental years of the company.

CHESTER N. CHUBB has been elected president of the United Light & Railways Co. to succeed Frank L. Conrad, resigned. He has been recently serving as a vice president of American Light & Traction Co. and in assuming his new executive duties will continue on the board of directors of that utility.

Mr. Chubb is among those executives who have seen the development of the electric and gas utilities from the early pioneer stages. Starting with the United Gas Improvement Co., Philadelphia, in 1902 he spent 15 years with that organization and then became affiliated with the United Light & Power Co. He relinquished his duties with United Light in 1925 to go to Lincoln, Nebr., as president of the Iowa-Nebraska Light & Power Co., a position he held for four years. He then spent two years in Europe and upon his return to this country became a vice president of the American Light & Traction Co. Mr. Chubb served as president of the San Antonio Public Service Co., an American Light & Traction subsidiary, from 1935 until the company was purchased by the city of San Antonio in 1942.

Associated with the United Light system since 1939, Mr. Conrad was for several years executive vice president and a director of the United Light & Railways Co., before his election to the presidency in 1945. As chief executive he was chiefly concerned with problems of integration facing the system under the Holding Company Act.

Announcement has been made of the appointment of FRANCIS W. CRANDALL as manager of the Washington, D. C., office of Ebasco Services Inc. He succeeds WILLIAM P. REILLY, who recently resigned to become president of the Arizona Power Company.

Following graduation from Cornell, Mr. Crandall was for several years engaged in various branches of engineering work. In 1939 he was made executive secretary of the National Defense Power Committee, and three years later he was commissioned a Major in the U. S. Army and appointed as the Army's representative on power matters on the Army & Navy Munitions Board. Later as Lieutenant Colonel he was attached to the U. S. Military Mission to Moscow in 1944.

Before joining Ebasco Services last year he was connected with the Office of the Army's Chief of Staff as a civilian, initiating plans and procedures for peacetime power activities.

Announcement has been made recently by the Delaware Power & Light Co., Wilmington, of the creation of two new positions. HARVEY H. PLANK, formerly vice president and assistant general manager, has been named vice president in charge of engineering and operations, and LLOYD R. LESLIE, formerly commercial sales manager, was appointed vice president in charge of sales and public relations. At the same time, FRANK P. HYER was appointed supervisor of operations and THOMAS W. MCKENNA, formerly supervisor of industrial gas sales, commercial sales manager.

Mr. Plank became identified with the company as assistant to the general manager in 1943, being subsequently elected vice president. Prior to his Wilmington connection, he was associated for many years with the United Gas Improvement Co. in Philadelphia.

After spending several years in sales promotion work with the Philadelphia Electric Co. in West Chester and Ardmore, Mr. Leslie joined Delaware Power in 1929 as sales manager. Having been in charge of commercial and appliance sales, he has been closely associated with the Chamber of Commerce in the promotion of Wilmington's business interests and has been engaged in many civic activities.

EVERETT L. PALMER, formerly assistant to the operating manager of the Pennsylvania Power & Light Co., Allentown, has been named assistant to the president. After completing the student training course, Mr. Palmer entered the general commercial department of the company. Two years later he became assistant to the general

commercial manager and in 1940 was named manager of the rate and contract department.

HARRY W. PITZER of Chickasha, Okla., has been elected a vice president of the Public Service Co. of Oklahoma. In addition to his new duties as vice president, Mr. Pitzer will continue in his former capacity as coordinator and director of the company's southwestern division with headquarters in Chickasha.

Mr. Pitzer has been in the electric utility business since 1920 and has been associated with the Public Service Co. since 1926. Beginning with the company as an engineer, he became the McAlester area manager in 1930 and was later transferred to Chickasha in 1936 as vice president of the Southwestern Power & Light Co. When that company was merged with the Public Service Co. in 1945, he was made coordinator of the company's southwestern division, the position which he continues to hold under his new assignment.

HENRY P. MEGARGEE has been appointed director of public relations of the American Gas & Electric Service Corp. and in this capacity will be charged with coordinating public relations, publicity and advertising activities of the operating affiliates in the AG&E system. Mr. Megargee entered the employ of the company in 1910 and, except for army service during World War I, has been with the company since that date. For the past 16 years he has been sales promotion and advertising manager for American Gas & Electric. E. A. SNYDER succeeds to Mr. Megargee's sales promotional activities and he has been appointed manager, domestic-commercial sales, for the system. Mr. Snyder became identified with the Ohio Power Co., an operating affiliate of AG&E in 1921. He entered the employ of the parent company in 1929 and has been engaged in sales promotional work since 1929.

HAROLD B. TYREE, assistant to the president, has been made responsible for all of the Detroit Edison Company's transactions with unions; and LYNDEN J. KAUFMANN, former union relations adviser, has been appointed to the president's staff as deputy union negotiator, according to an announcement by James W. Parker, president.

Mr. Tyree came to the company in 1919 and for the past six years has been concerned with labor matters as an assistant to the president. Prior to that he was fuel purchasing agent and later supervising engineer of the research department.

He was born in Huntington, West Virginia and attended VMI and Ohio University. During the first World War he was a captain of infantry. In World War II he was chief of the tank and automotive section, Detroit Ordnance District and later consultant to the chief, industrial section.

Mr. Kaufmann first came to the company in 1924 and has been in personnel work for many years. After graduating from the University of Michigan in 1929, where he majored in economics, he worked in the company's employment bureau and was assigned special duties in the personnel field. Since 1942 he has been actively engaged in union relations work.

J. A. PURCELL has been appointed division manager of the newly-created Western Division of the Philadelphia Electric Company. His headquarters will be at Coatesville.

Mr. Purcell is a graduate of The Johns Hopkins University of Baltimore, and has been employed by the Philadelphia Electric Company since 1930. He held various positions in both the electric and gas departments of the company prior to his appointment as division superintendent at Coatesville in 1943, the position he held at the time of his recent appointment. Mr. Purcell has taken a prominent part in civic affairs and is presently president of the Coatesville Chamber of Commerce. He is also president of the Coatesville Rotary Club.

MAX E. BRETSCHNEIDER has been named director of employment of the Kansas City Power & Light Company by John W. B. Foringer, vice president in charge of industrial relations. The appointment represents a transfer by Mr. Bretschneider from the Meter and Laboratory Department of the company where he has been employed for the past sixteen years.

Mr. Bretschneider has a degree in Electrical Engineering from Northeastern University in Boston. He first joined the Power & Light Company in 1931 as a test engineer in the company laboratory moving to assignments as laboratory foreman in 1937 and as assistant superintendent of the Meter and Laboratory Department since 1944.

The new employment director is past chairman of the Kansas City Section of the American Institute of Electrical Engineers, a former member of the Meter and Service Committee of Edison Electric Institute, a member of the Missouri Society of Professional Engineers, the Missouri Valley Electric Association and the National Society of Professional Engineers. He is also a life member and past National Director of the National Rifle Association.

C. D. MURDOCK of the Overhead Department has been appointed company safety director. NORVIN H. WELCH of the System Operating Department has been appointed company training director.

Lighting Program Available For Grade Schools

(*Continued from page* 255)

one being furnished for each day's lesson.

The background and a detailed description of the program, which was developed by the Bureau's Home Lighting Education Committee, in consultation with the Research Division of the National Education Association, Washington, D. C., are presented in two plan books, one of which is intended for the guidance of utility representatives in planning their use of this project. The second plan book, designed for presentation to school administrators, outlines the reasons for this program and demonstrates its value to the pupils.

"The need for this program, and the type of material to be included, were indicated by the results of a survey of 150 school administrators and teachers in 26 states, 98 per cent of whom expressed approval of such a program. The information contained in the charts, leaflets and other educational aids was initiated at a two-day meeting of school teachers, administrators, officials of the Research Division of the National Education Association, followed by two years of research and study by members of the Bureau," it was said by H. A. Stroud, Chairman of the Bureau's Home

Lighting Education Committee. "The program itself was designed as the answer to thousands of requests from school personnel for educational material on the principles of light and sight, and to bring to their pupils the latest sight-saving information from our lighting laboratories, which can best be made available by the local electric company's sponsorship of this program."

Complete sets of these materials, for classes of 40 pupils, are offered by the Bureau at $6.50 per set. Plan books and materials are available from the Better Light-Better Sight Bureau, 420 Lexington Avenue, New York 17, New York.

The Engineer and Internationalism

(*Continued from page* 253)

system of reward and recognition for meritorious accomplishment.

Let us not be misled by some of the modern trends to start grandiose developmental projects in which the size of the appropriation and pay roll, and the false security of regimentation, form the apparent measure of importance and value of the objective.

As John Foster Dulles has stated:

"Peace requires that the free societies be so healthy that they will repel communist penetration, just as a healthy body repels malignant germs. This is the only way to prevent communist dictatorships from so spreading that they will isolate us and eventually strangle us.

"How can that need be met? A rich nation, like a rich man, is apt to think first that its money can save it. No nation is so poor as a nation that has only dollars to give. We would, of course, have to provide money and goods. But the essential is that out of the physical vigor of our people and the intellectual stimulus of our free society should come the constructive ideas for which the whole world stands in wait."

The constructive ideas which are now available and waiting for others cannot be effectively used until there is a tuning in on the receiving end by dismissing many traditional deterrents and facing certain issues quite fairly.

Engineers should always freely and cooperatively strive toward the best economic answer regardless of national boundaries, whether operating on land, sea, or in the air. Engineers should also avoid unsound tradition, personal inhibitions, individual or minority interests, and seek to serve the majority, who are entitled to pay less money for more comforts and achievements, so long as all are willing to cooperate with others—their mutual neighbors.

CONVENTIONS AND MEETINGS

1948

SEPTEMBER

20-21 Iowa Utilities Association, Fort Des Moines Hotel, Des Moines, Iowa.

20-24 Illuminating Engineering Society, National Technical Conference, Hotel Statler, Boston, Mass.

21-22 Pennsylvania Electric Association Annual Meeting, William Penn Hotel, Pittsburgh, Pa.

OCTOBER

4-8 American Gas Association, Auditorium, Atlantic City, N. J.

7-8 Pennsylvania Electric Association, Transmission and Distribution Committee, Bedford Springs Hotel, Bedford Springs, Pa.

11-12 Prime Movers Committee, EEI, William Penn Hotel, Pittsburgh, Pa.

11-12 Transmission and Distribution Committee, EEI, New Ocean House, Swampscott, Mass.

13-15 Indiana Electric Association, Annual Convention, French Lick Springs Hotel French Lick, Ind.

14-15 Electrical Equipment Committee, EEI, William Penn Hotel, Pittsburgh, Pa.

18-22 36th National Safety Congress, Chicago, Ill.

NOVEMBER

1-3 Wisconsin Utilities Association, Commercial and Technical Divisions, Pfister Hotel, Milwaukee, Wis.

8-13 National Electrical Manufacturers Association, Hotel Traymore, Atlantic City, N. J.

28-Dec. 3 American Society of Mechanical Engineers, Hotels Pennsylvania and New Yorker, New York, N. Y.

30-Dec. 3 National Electrical Contractors Association, Roney Plaza, Miami Beach, Fla.

DECEMBER

5-8 The American Society of Refrigerating Engineers, Washington, D. C.

JANUARY—1949

Jan. 31-Feb. 4 American Institute of Electrical Engineers, Hotel Pennsylvania, New York, N. Y.

MARCH

17-18 Oklahoma Utilities Association Annual Convention, Hotel Tulsa, Tulsa, Okla.

APRIL

3-7 Fifteenth Annual Sales Conference, EEI, Edgewater Beach Hotel, Chicago, Ill.

11-13 National Conference of Electric and Gas Utility Accountants, Book-Cadillac Hotel, Detroit, Mich.

MAY

2-4 Engineering Committees, EEI, Edgewater Beach Hotel, Chicago, Ill.

JUNE

1-3 ANNUAL MEETING, EDISON ELECTRIC INSTITUTE, Atlantic City, N. J.

20-21 Public Utilities Advertising Association, Netherlands Plaza Hotel, Cincinnati, Ohio

27-30 Canadian Electrical Association, Lake Louise, Banff, Canada

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